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A
MANUAL OF MEDICAL TREATMENT
OR
CLINICAL THERAPEUTICS.

WORKS BY DR. BURNEY YEO.

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CASSELL & COMPANY, Limited,
LONDON, PARIS & MELBOURNE.

A MANUAL

OF

MEDICAL TREATMENT

OR

CLINICAL THERAPEUTICS

BY

I. BURNEY YEO M.D. F.R.C.P.

PROFESSOR OF CLINICAL THERAPEUTICS IN KING'S COLLEGE LONDON AND
PHYSICIAN TO KING'S COLLEGE HOSPITAL
AUTHOR OF "FOOD IN HEALTH AND DISEASE" ETC.

WITH ILLUSTRATIONS

VOL. I.

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To

HIS FRIENDS AND PUPILS

AMONGST THE PAST AND PRESENT STUDENTS

OF

KING'S COLLEGE HOSPITAL

THIS WORK

IS DEDICATED BY THE AUTHOR.

PREFACE.

THE object of this work is the study of disease from the point of view of treatment. The teaching of Therapeutics is here approached from the side of the disease, and not from the side of the drug or remedy—a method which has been thought more natural and more interesting than the one usually adopted. It has not, however, been attempted to discuss questions of treatment apart from considerations of the clinical history, course, and pathological characters of each disease.

It is clear that any, or every part, of the natural history of a disease may bear, directly or indirectly, on its treatment, but some parts far more than others; and it would be most unphilosophical and unedifying to discuss the therapeutics of a disease without, at the same time, considering the true nature of the phenomena we are endeavouring to control.

It is by examining into the mode of *causation* of disease, by investigating the true nature of the morbid changes which underlie the *phenomena* of disease, and by an exact knowledge of the properties and mode of action of the agencies we introduce for the purpose of influencing favourably its course, that what are termed *rational indications* for treatment are arrived at.

These *indications* are based on observed facts; they have no concern with dogmas of any kind. Dogmatic medicine, no matter by what name it is known, is a thing of the past. It is wholly inconsistent with scientific methods, and it would be an unjustifiable waste of time here to discuss it. It will continue to have an attraction for certain minds, and that attraction will be found to be quite independent of the ordinary processes of reasoning, or the ordinary laws of evidence.

It has been the Author's aim in the following pages, wherever it was possible, to deduce rational indications for treatment from an examination of the pathological nature and the clinical course and characters of the disease under discussion; and if to discover and state such rational indications for treatment is all that is needed to render the practice of medicine *scientific*, then he ventures to hope that the study of the following pages will show, that the art of healing at the end of the nineteenth century is founded, to a very large extent, on a sound scientific basis.

A work having so wide a scope has naturally occupied the Author's thoughts for some years, and many chapters are founded on clinical lectures, devoted especially to the consideration of therapeutic questions, which it has been his duty, from time to time, to deliver in King's College Hospital.

The outlines of Part IV., on the treatment of Phthisis, were sketched and much material for its composition was collected during the period when the Author was one of the physicians of the Brompton Hospital.

At the time the writing of this work was begun Dujardin-Beaumetz was publishing in Paris his "Leçons de Clinique Thérapeutique," a work which has met with much success, and which was almost the only one then in existence which treated of therapeutics from the same point of view as is here adopted. Recently Hare's "System of Practical Therapeutics" has appeared in America — a very elaborate and valuable work—and, in England, Prof. Whitla's excellent "Dictionary of Treatment." The Author's method differs somewhat from all of these; he has endeavoured to avoid the tedious digressions, especially in the foot-notes, which add so greatly and unnecessarily to the bulk of the first-named treatise, and the elaborate and encyclopædic nature of the second work greatly exceeds the strict limitation to the subjects of Clinical *Medicine* which, from the outset, he proposed to himself; nor are the following pages intended for "rapid reference"; on the contrary, they ask for thoughtful consideration. Nothing could be more alien to rational therapeutics than the treatment of disease by "rapid reference"! It is not in this way that rational indications for the treatment of disease are arrived at, any more than are the data for accurate diagnosis.

Selections of formulæ, published for the most part by well-known physicians, are added to most of the chapters. The Author must not be understood to adopt the responsibility of recommending them; they are added for the purpose of giving completeness and breadth of view to the subject.

A word of caution may not be here out of place with regard to the modern tendency to adopt new remedies, some of them potent chemical agents, merely on the recommendation of their manufacturers. Serious consequences have resulted from this unwise haste to employ drugs of which we cannot be said to possess any *accurate* knowledge.

In conclusion, the Author has to express his indebtedness to his colleague, Prof. Watson Cheyne, for kindly looking over the many necessary references to surgical methods.

44, Hertford Street, Mayfair,
June, 1893.

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MANUAL
OF
MEDICAL TREATMENT.

Part I.

DISEASES OF THE ORGANS OF DIGESTION.

CHAPTER I.

TREATMENT OF DISEASES OF THE MOUTH, TONSILS, AND PHARYNX.

STOMATITIS.—Inflammation of the Mouth—Varieties: (1) Simple Catarrhal Stomatitis—Symptoms—Causes—Indications for Treatment. (2) Vesicular or Aphthous Stomatitis—Characters and Symptoms—Causation—Treatment. (3) Parasitic Stomatitis, Aphthæ or Thrush—Symptoms—Causes—Indications for Treatment—Prophylaxis. (4) Ulcerative or Pseudo-Membranous Stomatitis—Symptoms and Characters—Causation—Indications for Treatment. (5) Gangrenous Stomatitis, Cancrum Oris, Noma—Causation—Characters and Symptoms—Treatment. (6) Mercurial Stomatitis—Symptoms—Treatment. TONSILLITIS.—Varieties—Causes—Symptoms—Suppurative Form—Treatment—Prophylaxis—Chronic Hypertrophy of Tonsils—Follicular Tonsillitis. ACUTE PHARYNGEAL CATARRH.—Angina, or Sore Throat—Characters—Causes—Symptoms—Treatment. CHRONIC PHARYNGEAL CATARRH.—Varieties: (*a*) Simple. (*b*) Follicular, or Granular—Causation—Symptoms—Treatment—Mineral Waters. Additional Formulæ.

DISEASES OF THE MOUTH.

THERE are several forms of *inflammation of the mouth*, the treatment of which we have to consider; and although the indications for treatment are in most of them similar, yet for the sake of clearness it will be desirable to treat of each form separately, and in the following order:—

1. **Simple catarrhal stomatitis,** or **catarrh of the mouth.**—The principal symptoms of this affection are redness, tenderness, and swelling of the mucous membrane of the cheeks, gums, and tongue. The tongue is also covered with a thick fur, and shows the indentations of the teeth. The secretions of the mouth are increased, and its cavity is covered with thick yellow mucus. The sense of taste is blunted and perverted so that the patient complains especially of a "bad" taste, or a slimy, clammy, sometimes bitter taste, and a "foul" smell. In the form which accompanies dentition in infancy there is often much constitutional distress, and convulsions are sometimes induced.

The usual **causes** of this condition are dentition in infancy, cutting the wisdom teeth in adults, the presence of carious or badly arranged artificial teeth, the abuse of tobacco, of too highly-seasoned food and too hot beverages, and insufficient cleansing of the teeth and mouth.

It is frequently associated with the *febrile* state, and often accompanies gastric catarrh and habitual constipation. It may also be propagated from adjacent inflamed organs, as in facial erysipelas and inflammation of the throat. It is occasionally referrible to obscure nervous states.

The **indications for treatment** are *first*, the removal, when possible, of any of the causes enumerated above that may be found to exist; the sharp irritating edges of carious teeth must be removed, the smoking of strong cigars forbidden, and errors in food and drink corrected. Constipation must be relieved, and a saline aperient is almost always desirable. Coexistent gastric catarrh may require the administration of bismuth and alkalies. *Secondly*, emollient cleansing and antiseptic washes are needed to remove the foul secretions, and to keep the oral cavity clean, and to soothe the irritation. At first lotions of tepid gum-water or barley water, with 5 or 6 grains of bicarbonate of soda to the ounce should be used. The carbonates of the alkalies exert a solvent action on mucus, and so serve to detach and wash away the foul sticky mucous secretions covering the inflamed mucous membrane. Lime water, borax washes, chlorate of potash and borax tabloids are useful. A wash containing salicylic acid 1 part, dissolved in sufficient alcohol, and added to 250 parts of water, has the advantage of acting both as an antiseptic and an anæsthetic. Preparations of eucalyptus or hydrastis may be added to borax washes.

In troublesome cases the mucous membrane may be brushed with a solution of corrosive sublimate (1 in 5,000) or of nitrate of silver (2 grains to the ounce). If there is diarrhœa astringents and opiates may be needed. Sucking fragments of ice will often relieve the heat and sensitiveness of the mouth. The following is a good formula for a mouth wash :—

℞	Boracis	120 grains.
	Sodii bicarbonat.	40 ,,
	Tinct. eucalypti	1 oz.
	Glycerini	½ ,,
	Aquæ	ad 8 ,,
	M. f. lotio.	

or :—

℞	Potassii chloratis	40 grains.
	Boracis	80 ,,
	Aquæ rosæ	ad 8 oz.
	M. f. lotio.	

2. **Vesicular stomatitis,** also termed **aphthous stomatitis,** and **herpes of mouth,** and **aphthæ.**—In this affection small white spots (often termed aphthæ) appear on the mucous membrane of the mouth, the spots are surrounded by a red border and are said to be at first *vesicular*, but this is doubtful. The white spots are probably an exudation from the free surface of the mucous membrane beneath the epithelium; these spots are thrown off, and raw excoriated surfaces left. They occur on the anterior half of the tongue, on the inner surface of the lips and cheeks, and on the hard palate; they are round,

about the size of lentils, often numerous and apt to run together into confluent irregular patches. There is usually abundant mucous catarrh of the mouth, and increased salivation. The breath is foul from decaying epithelium, and the mouth is hot and painful. There are also feverishness and loss of appetite.

With regard to its **causation,** it is more frequent in children than in adults, and it is prone to occur in feeble, ill-nourished, scrofulous children during the period of dentition. It is also observed to accompany certain exanthemata, and particularly measles, as well as other cutaneous affections. It seems at times to be epidemic, especially amongst parturient women (*stomatitis materna*), and to spread by contagion. It is often found to occur in institutions where children are crowded together, with insanitary surroundings, and unsuitable or insufficient food. It frequently accompanies exhausting and debilitating diseases. Excessive humidity and inundations are said to favour its appearance.

The **treatment** should be begun with a mild antacid laxative, such as rhubarb and magnesia. If, however, there is diarrhœa, a powder consisting of 2 to 4 grains of subnitrate of bismuth and 1 to 3 grains of compound kino powder (according to the age of the child), and 2 to 4 grains of sodium bicarbonate may be given three times a day. Potassium chlorate is an excellent remedy. To young children it may be given dissolved in water, 2 grains and upwards, according to age, every two or three hours. In *stomatitis materna* large doses must be prescribed, viz. 15 to 20 grains three or four times a day.

The **local treatment** must consist at first in the use of demulcent and antiseptic washes.

A variety of *antiseptic* washes has been suggested, *e.g.* a solution of sulphite or hyposulphite of sodium, 30 grains to the ounce, creasote water, boric acid in saturated solution, borax washes, chlorine water, chlorinated soda solutions, carbolic acid lotion (3 to 5 per cent.)—this has the advantage of being anæsthetic—

the application by means of a camel-hair brush of dry alum, borax, or bismuth. If the spots are slow to heal they may be touched with solid nitrate of silver, or with a strong solution of the same (60 grains to the ounce), or with a solution of cupric sulphate (10 grains to the ounce), or zinc sulphate (20 grains to the ounce), or mercuric chloride (1 grain to the ounce), or iodoform may be applied.

Ashby and Wright recommend touching the spots with *lapis divinus*, which is made by fusing together equal parts of cupric sulphate, alum, and potassic nitrate. In cachectic cases tonics must be given internally. Quinine in $\frac{1}{2}$- to 2-grain doses with 2 to 5 minims of dilute nitric acid three or four times a day. The diet should be bland but nutritious, and stimulants are freely needed in bad cases. In young children milk and barley water, mixed, should be given, in preference to beef tea, as beef tea and saline solutions may cause smarting of the mouth.

Emollient and Antiseptic Mouth Wash.

℞	Glycerini acid. carbolici	$\frac{1}{2}$ oz.
	Potassii chloratis	2 drams.
	Decoct. althææ ... ... ad	8 oz.

M. f. lotio.

Another.

℞	Acid. borici	2 drams.
	Glycerini	2 ,,
	Decoct. hordei ... ... ad	8 oz.

M. f. lotio.

3. **Parasitic stomatitis, aphthæ, thrush.**—This disease has been confounded with the preceding; it is, however, a special form of inflammation of the mouth due to the development in its mucous membrane of a parasitic, vegetable, confervoid growth, the *oidium albicans.* It commences with dusky redness, heat, dryness and tenderness of the mucous membrane, accompanied by an acid reaction of the buccal secretions; this is followed by the appearance of circular milk-white slightly prominent spots, which run

together into irregular flakes or patches, covered with a peculiar white curd-like secretion. It is found on the dorsal surface of the tongue, on the inside of the lips and checks, and especially on the folds connecting the gums with the lips and cheeks; it extends also to other parts of the buccal membrane, and into the pharynx, whence it descends into the œsophagus. It has been found in the stomach and the cæcum (where the secretions are *acid*), and in cachectic states it is not unusual to find it round the anus and genital organs. The mouth is extremely sensitive, and sucking or mastication or any attempts at feeding by the mouth are painful and difficult. Sometimes it is attended by vomiting and diarrhœa. When it supervenes on low cachectic states it is usually of evil omen.

It is most common in infants during the first two weeks of life, and it is generally caused by want of cleanliness and deficient care in feeding, thus inducing a morbid acid condition of the oral secretions. It appears to be often conveyed from child to child by bottle-feeding. In older children, in adults and old people, it is apt to appear towards the close of exhausting, cachectic diseases. It is contagious.

This fungus seems to require an acid medium for its development, and its occurrence in young infants has been supposed to be due to the preponderance of mucus, which is prone to turn acid, over the alkaline saliva, in their oral secretions.

The **indications for treatment** in this affection are, apart from those dependent on any co-existing cachexia, to remove the parasitic growth from the mucous membrane, and by restoring a healthy condition of the oral secretion, to prevent its re-development. As a *preventive* measure it is desirable to wash out the mouths of weakly infants after suckling, and especially after using the bottle, with a clean soft wet rag or camel-hair brush soaked in water. To remove the parasitic patches it is best to rub them off gently with a piece of soft linen wrapped round the tip of the finger, and then cleanse the cavity of the mouth with some alkaline, antiseptic wash, such as a 5 per cent. solution of borax or sodium benzoate. The following lotion may also be used every two or three hours:

℞	Boracis	½ oz.
	Glycerini	½ „
	Tinct. myrrhæ	2 drams.
	Aquæ camphoræ	ad 8 oz.
	M. f. lotio.	

or this :—

℞	Sodii benzoatis (or salicylatis) ...	160 grains.
	Sodii bicarb.	80 „
	Aquæ rosæ	ad 8 oz.
	M. f. lotio.	

The above may also be used as a spray for the mouth and throat. Honey is to be avoided (as is mel boracis), since it may aggravate acid fermentation.

In obstinate cases the patches (after wiping) may be touched with a solution of argentic nitrate (1 to 2 per cent.), or cupric sulphate (2 grains to the ounce), or carbolic acid (2 grains to the ounce). Solutions of sulphurous acid and of salicylic acid, and even of glycerine alone, have been found useful. If there should be diarrhœa, as is not uncommon, small doses of bismuth subnitrate with chalk mixture may be given to check it. Forchheimer says small doses of calomel act like a specific in intestinal troubles due to this parasite. With infants, whenever it is possible, a wet nurse should be preferred to artificial feeding. If this is impracticable great care must be observed in the preparation of the infant's food—sterilised cow's milk mixed with a little lime water or a small quantity of a 5 per cent. solution of sodium bicarbonate should be used so as to insure its having an alkaline reaction. Care should also be taken that the bottle, the nipple, and any vessels used in the preparation of the food are thoroughly clean. Plenty of fresh air and good sanitary surroundings should be secured. If owing to the sensitiveness of the mouth the child refuses to feed, a tube attached to a funnel may be passed along the floor of the nose into the pharynx and fluid nourishment thus administered. When this disease occurs in connection with some general cachexia, tonics and stimulants appropriate to the treatment of the constitutional affection must be given.

4. **Ulcerative stomatitis,** or pseudo-membranous stomatitis.—This form of stomatitis is usually unilateral, and affects most commonly the left side. The ulcers generally appear first on the outer border of the gums, especially of the lower jaw, and on the corresponding surface of the cheek and lip. They may extend to the tongue and palate, and the roots of the teeth are often laid bare by the ulcerative process. The ulcers are covered, as a rule, by whitish or dirty grey necrosed patches of mucous membrane, and surrounded by a red, swollen rim; they bleed easily. The tongue is swollen and thickly furred, indented by the teeth, and ulcerated at its edges. There is usually much fœtor of the breath, salivation, slight fever, and great sensitiveness of the mouth and consequent difficulty in eating and swallowing. The submaxillary, sublingual, and retro-maxillary glands on the affected side are swollen. If neglected, this disease may cause necrosis of the alveolar processes and disruption of teeth; but when properly treated the ulcers clean and heal rapidly, but leave cicatrices.

This affection is usually found to arise in connection with insanitary dwellings and habits, insufficient and improper food, and other depressing agencies. It is often epidemic in hospitals, schools, prisons, camps, etc. It is especially prone to attack children, particularly feeble ones, between four and ten years of age, after measles. Carious teeth may act as an exciting cause. It is probably contagious.

The **indications for treatment** are to remove unhealthy surroundings, improve the general health, and to restore a healthy condition of the buccal cavity, and promote healing of the ulcers by soothing, cleansing, and antiseptic applications. Potassium chlorate appears to exert almost a specific influence over this disease, and it should be given internally and applied locally. Children may take 2 to 5 grains and adults 10 to 20 grains three or four times a day, and it may be prescribed locally in a mouth wash containing 10 to 20 grains to the ounce. Other useful local applications are washes containing boric acid, salicylic acid, or carbolic acid.

The sensitiveness and tenderness of the mouth may be allayed by adding a little opium to the washes that are used, or by spraying or mopping the mouth with a dilute solution of hydrochlorate of cocaine. The mouth should be thoroughly cleansed with warm water after every meal, and the gums and teeth may be cleaned with a bit of absorbent cotton wool. After this it has been recommended to wash the gums with a mixture of 2 parts of glycerine of borax and 1 part of tincture of myrrh. If the ulcers are slow to heal, they may be touched twice daily with a solution of nitrate of silver (10 grains to the ounce), or with dry alum, or with tincture of iodine, or with iodoform. As these applications are very painful, the ulcers may be first mopped with a solution of cocaine hydrochlorate. Loose teeth and loose fragments of necrosed bone should be promptly removed.

Tonics of quinine and iron, together with cod-liver oil, will be needed in most cases, with good air and good food; the latter should be nourishing, but unirritating and easy of digestion. During the acute period, milk, beef-tea, soaked bread, and other nourishing fluids will be best.

Antiseptic and Soothing Mouth Wash for Adults.

℞ Potassii chloratis	80 grains.
Extract. opii liquidi	2 drams.
Aquæ laurocerasi	1 oz.
Decoct. hordei	ad 8 ,,

M. f. lotio.

Antiseptic Salicylic Lotion.

℞ Acidi salicylici	32 grains.
Spr. vini rectif.	3 drams.
Aquæ camphoræ	ad 8 oz.

M. f. lotio. (Dissolve the acid in the spirit and then add the water.)

5. **Gangrenous stomatitis, cancrum oris, noma.**—This very grave affection is, happily, rare. It occurs in children between three and six years of age, usually as a sequel or concomitant of some exhausting disease in those that are ill-nourished and of a strumous diathesis. Measles is the disease it most commonly follows. It has also been encountered after whooping cough and typhus. The excessive use of mercury has been said to favour its occurrence. It begins as a swelling of the cheek on *one* side, involving the *lower* lip usually, and it spreads over the face. The mucous membrane lining the corresponding buccal surface is found to be ulcerated, and this ulceration spreads to the adjacent gums, so that the teeth become denuded and loosened, and the bone itself may be attacked and undergo necrosis. There is usually a hard, rounded nodule to be felt in the centre of the swollen cheek. A fœtid, gangrenous odour proceeds from the mouth. Gangrenous scars form both externally and internally. These separate and leave a hole in the cheek, exposing the diseased jaw and denuded teeth. Pneumonia often supervenes, and diarrhœa, and the disease is commonly fatal during the second week. Recovery sometimes occurs before the cheek becomes perforated, but ordinarily great deformity is left behind from extensive gangrene of the face, nose, and adjacent parts. It is said to be fatal in at least seventy-five per cent. of cases.

Treatment.—This consists mainly in local cauterisation, under chloroform, with the actual cautery or pure nitric acid.

After carefully drying the parts with lint, sticks should be dipped in strong nitric acid and then rubbed well into the edges of the sloughing parts, and over the surface of the gums, any loose sloughs being previously cut away and sequestra removed. Care must be taken that the acid does not run over the sound skin. It will be usually necessary to make several applications, the parts being well dried between each. A little iodoform should be subsequently powdered-on and the surface smeared with carbolic oil.* Some prefer hydrochloric acid or the acid solution of mercuric nitrate.† After cauterisation, antiseptic washes or injections or sprays must be used day and night to cleanse the mouth of dead and decomposing matter.

Beneficial results have been reported from the local application of undiluted carbolic acid, followed by the frequent use of a 2 per cent. wash of the same ;‡ one case recovering without perforation of the cheek. Other local applications reported to have been followed by good results are the pure tincture of perchloride of iron, solution of cupri sulphatis (30 grains to the ounce), and subnitrate of bismuth. Mr. Rundle, of the Royal Cornwall Infirmary, reports a very successful treatment of two cases of this affection by swabbing the ulcerated surfaces with a 1 in 1,000 solution of perchloride of mercury. The effect, he says, "was magical." In a fortnight the children were perfectly well.§

For cleansing the mouth chlorinated soda lotions may be used (liquor sodæ chlorinatæ, 1 ounce ; aquæ ad 16 ounces), or a 5 per cent. solution of carbolic acid.

Tonics should be freely given, especially quinine and perchloride of iron ; as well as an abundance of nourishing food and stimulants ; as much wine and brandy as the child will take—3 to 4 ounces in twenty-four hours for a child of five years.|| Eggs beaten up with milk, strong soups, wine-whey, pounded meat, are the best foods. Nutrient enemata may be given if sufficient food cannot be administered by the mouth.

The troublesome scars and deformities left behind in cases that recover may be remedied by appropriate surgical treatment.

6. **Mercurial stomatitis**, or mercurial salivation, is caused, as its name implies, by intoxication with mercury, either given as a medicine, or from contact with the metal in the arts.

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* Ashby and Wright.

† Solis Cohen.

‡ Meigs and Pepper.

§ *British Medical Journal*, Feb. 14, 1891.

|| Ashby and Wright.

The symptoms consist of a peculiar fœtor of the breath, a metallic taste, soreness of the gums and mouth, and profuse secretion of saliva. The lips, the tongue, and the whole of the buccal mucous membrane become involved. The lymphatic glands of the lower jaw are enlarged and painful; the tongue is sometimes greatly swollen, and mastication and swallowing are difficult. If this affection proceeds unchecked it may take the form of ulcerative stomatitis, and occasionally necrosis of the lower maxilla occurs. It varies greatly in severity, and in its manifestations and duration.

The **treatment** of this form of stomatitis requires, in the first place, that the patient should be withdrawn immediately from the influence of the metal. It is said that the administration of potassic chlorate acts as a prophylactic with workers in the metal. This is also one of the best remedies for the disease: 30 to 60 grains a day is usually quickly followed by amelioration and cure. It soon removes the characteristic fœtor. Antiseptic and cleansing mouth washes are needful, to which some opium may be added (as well as given internally) to relieve pain. The best are solutions of potassic chlorate, creasote water, borax with tinctures of myrrh and cinchona, saponified emulsion of coal-tar, brandy and water lotion (*Watson*). Sometimes a wash of acetate of lead (10 grains to the ounce) proves very soothing, and some think highly of an iodine wash ($\frac{1}{2}$ dram of the tincture to an ounce of water). Cauterisation is occasionally needed either with nitrate of silver or hydrochloric or chromic acid (1 in 5). To check the excessive salivation a tannin lotion will prove serviceable (1 dram of glycerine of tannin to an ounce of rose-water); or this distressing symptom may be controlled by belladonna (5 to 10 minims of the tincture every four or five hours), or a hypodermic injection of atropine ($\frac{1}{120}$ grain) may be given. *Internally*, besides potassic chlorate, as already mentioned, tonics are indicated, and nitric acid has been found especially useful—10 minims of the dilute acid with a grain or two of quinine in an ounce of water, three or four times a day.

As mastication may be impossible and swallowing difficult, either fluid or soft pulpy foods must be administered. Milk, beef-tea, whipped eggs, pounded meat mixed with nourishing soups, soaked stale bread made into a thin pap with milk, oatmeal gruel, and other fluid foods, may be given. If swallowing should be especially difficult and painful, nutrient enemata must be administered.

DISEASES OF THE TONSILS.

Tonsillitis.—The tonsils in some persons are very prone to inflammation. Three principal kinds of tonsillitis have been described. First, *a catarrhal or superficial* form in which the mucous membrane only is inflamed, but this is only a part of an ordinary sore throat or catarrhal pharyngitis (angina catarrhalis). *Secondly*, a *follicular* or *lacunar* tonsillitis, when the follicles *especially* are inflamed and plugged with exudation; this also may be a part of a general pharyngitis. Neither calls for any special treatment apart from that of the general affection of the pharynx. *Thirdly*, a *parenchymatous* or *suppurative* tonsillitis; this is commonly known as **quinsy**, and is the form of tonsillitis which will chiefly now occupy our attention.

As to the *causes* of tonsillitis, constitutional predisposition is a very prominent one. Some persons appear to inherit a peculiar susceptibility to inflammation of the tonsils, and will suffer during their lives from repeated attacks. Scrofula is particularly apt to excite the more chronic and permanent forms of early childhood; rheumatism and gout the severe acute forms of youth and adult life. Attacks of acute rheumatism have often been observed to be preceded by attacks of acute tonsillitis. The exanthemata not infrequently excite tonsillitis.

The *symptoms* of acute phlegmonous tonsillitis are highly characteristic. Fever is usually present from the beginning and the temperature often reaches 104° or 105° F. Pain, often extending into the ear, and difficulty in swallowing and a feeling of soreness and heat in the throat call attention to that part, and on looking into the throat one or both tonsils will be found to be red, swollen, and projecting into the pharynx. Both may be involved together, often they will be seen nearly or quite touching one another, and filling up the whole of the entrance to the pharynx; more commonly the inflammation of the second tonsil follows that of the first. The soft palate and uvula share in the inflammation, the mucous membrane being intensely red and inflamed, and the whole uvula being swollen and elongated. The inflamed parts, at first dry, soon become covered with a viscid, sticky mucus, and owing to the obstruction in the throat and consequent difficulty of swallowing, the saliva escapes freely from the mouth. Pain and swelling about the angle of the jaw, which sometimes extends to the adjacent salivary glands, make it difficult for the patient to open the mouth so as to permit of full inspection of the throat, and the forefinger must be introduced to explore the condition of the tonsils. Besides the other symptoms of fever there are usually headache, restlessness, a thickly-coated tongue, foul breath, nausea, loss of appetite, constipation, and scanty, high-coloured urine.

The inflammation of the tonsil may end in resolution or suppuration.

In the former case the parts may be restored to their natural condition in ten or twelve days, but frequently more or less permanent enlargement of the tonsil remains. In suppurative cases, after four or five days, the occurrence of slight rigors and the complaint of throbbing pain and great tension in the inflamed tonsil indicate that pus has formed there. Usually the abscess bursts suddenly, sometimes during sleep, and its contents are swallowed; or it is discharged from the mouth, great and immediate relief accompanying this termination.

In the **treatment** of acute tonsillitis much may be done, if the case is seen early, to prevent suppuration, or when this result is inevitable, to hasten it. In young children, and in some young adults, most acute throat affections are very amenable to the influence of *aconite.* It is of little use in older patients, and its use, in all cases, is pretty well limited to the first twenty-four hours. If it has not had by that time a marked effect on the fever and the throat discomfort it is as well to lay it aside for some other remedy. A child between five and ten years of age should be given 1 minim of tincture of aconite (or a pilule of aconitine containing $\frac{1}{480}$ of a grain), with a dram of liquor ammoniæ acetatis and a little syrup of orange peel and water every two or three hours, for six doses; from 10 to 15 years, 2-minim, and above 15 years 3-minim doses may be given. This remedy will sometimes remove the early inflammatory throat affection in children as if by enchantment. A saline aperient should always be given at starting.

For children a powder that is *tasteless* has such an advantage over other medicines that we may give one containing a grain of calomel mixed with 2 grains of sugar, and wash it down with two tablespoonfuls of Dinneford's fluid magnesia mixed with a teaspoonful of syrup of lemons; this mixture makes a pleasant, cooling drink, which may be repeated every hour until the bowels are freely relieved. Mouthfuls of iced milk and water are useful in this stage, combined with ice-cold compresses externally.

For older patients we think highly of the remedial effects of *guaiacum;* patients who have gone through former attacks with and without this drug know its value although they dislike taking it. An ounce of the guaiacum mixture of the B.P. should be given every four hours; or a teaspoonful of the ammoniated tincture may be added to half a glass of milk, and this mixture may be used as a gargle and then swallowed. It should be taken every two hours, until it begins to purge.* *Salol* in large doses has also been highly commended. In very pronounced rheumatic cases sodium salicylate may be given in doses of 10 or 15 grains every two or three hours until relief is felt. Some apply salicylic acid directly to the surface of the tonsils.

The following formula has been suggested :—

℞ Acidi salicylici	2 drams.
Sodii bicarbonatis	$1\frac{1}{2}$,,
Glycerini	1 oz.
Aquæ menthæ pip.	ad 4 ,,

M. A tablespoonful every 2 or 3 hours.

An active saline purgative must also be given, such as 2 drams of sulphate of soda or magnesia, with 20 grains of carbonate of magnesia in an ounce of peppermint water every four hours until free action of the bowels is established. We have seen advantage follow the addition of 5 minims of ipecacuanha wine to each dose of this aperient mixture, especially when the patient is seen for the first time in the more advanced stage, and when it is desired to hasten suppuration.

The attack can sometimes be arrested at the very commencement by scarification of the inflamed tonsil, the incisions being allowed to bleed freely. The subsequent application of a 10 per cent. solution of cocaine to the surface of the tonsil appears to hasten resolution. Or the injection of a few drops of this solution into the inflamed tonsil by means of a hypodermic syringe provided with a long needle, in the early stage, is often of great value in relieving pain. When the disease cannot be arrested, cocaine may also be of service in allaying suffering. A 4 to 8 per cent. solution may be sprayed on to the tonsil for a few seconds at a time, the nozzle of the atomiser being introduced between the teeth and directed towards the tonsil.

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* Sajous, in Hare's "System of Practical Therapeutics," vol. ii. p. 457.

In severe cases, and for hastening suppuration, we have found nothing more efficacious than a gargle of *hot* water containing about 2 grains of borax or of bicarbonate of soda to the ounce; the patient should be directed to keep gargling or holding this in his mouth as constantly as possible. Inhaling the steam of hot water, or hot water containing some aromatic substance such as benzoin, camomile, sage, hops, camphor, or opium, is also very useful. Externally profuse hot fomentations, applied frequently with a large sponge, the head and neck being held over a large basin, and in the intervals hot moist sponges fastened round the throat, greatly hasten the progress of the case. If we can distinctly satisfy ourselves that there is a superficial collection of pus which we can easily reach by a guarded bistoury we should at once let it out, but patients constantly complain of being uselessly put to pain by these punctures which appear to give no relief. The swollen and œdematous surface of the tonsillar swelling often gives a fallacious sense of fluctuation to the finger, which induces the medical attendant to puncture prematurely.

Hypodermic injections of morphine and atropine are sometimes given to allay the suffering, and some physicians think, if given early, they tend to shorten the course of the disease.

After suppuration and discharge of the abscess, tonic treatment is needed—bark and ammonia in rheumatic cases, or quinine and acid in non-rheumatic cases, or iron and quinine in cases of great debility.

The following antiseptic gargle in acute tonsillitis, after incision, is recommended by Schnitzler:—

℞ Sodii salicylatis	āā 40 grains.
Boracis	
Aquæ laurocerasi	1 dram.
Aquæ destill.	ad 8 oz.

M. f. gargar.

In children we have seen retrogression of the chronic enlargement, which remains after the acute stage, promoted by the use of Bourboule water, from 2 to 8 tablespoonfuls, according to age, given with a little hot milk night and morning. The employment of a weak iodine gargle (one dram of tincture of iodine and half an ounce of glycerine to 8 ounces of water) is also of use for this purpose, as is the syrup of the iodide of iron with cod-liver oil, especially in scrofulous cases; in which also change to the sea-side, if the season is suitable, with local and general sea-bathing, favours complete recovery.

Food during the acute stage must be fluid, and milk is the best. In the early stage, and whilst there are prospects of securing resolution, the milk should be mixed with ice-water, but in a more advanced stage, and when the object is to hasten suppuration, it should be drunk warm, or even as hot as it can be tolerated, diluted with a $\frac{1}{3}$ part of seltzer or Apollinaris water. Persons prone to repeated attacks of quinsy should be recommended, as a *prophylactic*, to sponge the throat and back of the neck daily with cold water, or direct a cold spray douche over these parts. The throat should also be gargled every morning with cold water containing 2 or 3 grains of borax and a few drops of tincture of myrrh to the ounce.

Chronic enlargement of the tonsils (hypertrophy), which is often found in children, and reaches at times to such a degree as to cause deafness, and to seriously embarrass respiration, requires the removal of the hypertrophied organs. Slighter degrees of enlargement following acute tonsillitis may be greatly benefited by iodine gargles (as already suggested) or the rubbing in under the angle of the jaw of soap liniment containing 2 drams of iodide of potassium to the ounce. The local application of glycerine of tannin is advantageous when the tonsils are soft and spongy. If removal is determined upon, the best instrument for the purpose is Mathieu's guillotine; unless the tonsils are very large, long, and narrow, then it is best to use the vulcellum forceps and a blunt-pointed bistoury. Excessive bleeding may be stopped by the application with the finger of a powder made of one-third alum and two-thirds tannin.

In the **follicular tonsillitis** which often accompanies certain forms of pharyngitis, a gargle of creolin has been found very useful by Itzig.* The throat should be gargled several times a day with equal parts of a 1 per cent. solution and warm water. The pricking sensation it leaves in the throat may be relieved by gargling afterwards with pure warm water. He found the purulent plugs came away and the pain and fever disappeared in twenty-four hours.

DISEASES OF THE PHARYNX.

Acute pharyngeal catarrh (*sore throat, angina*).—In this disease, as in tonsillitis, the inflammation is not confined to any special part of the throat, but extends usually to the *whole* throat. The soft palate and uvula are almost invariably affected, and the faucial arches often more so than any other part; the catarrhal state also commonly extends to the back of the nose (post-nasal), into the mouth and to the epiglottis and larynx. Hence the more general term "sore throat" is preferable.

Usually, and in mild forms, there is simply an erythematous inflammation of the mucous membrane of the pharynx, palate, and tonsils, which, under favourable conditions, subsides in a few days. In more severe cases there is more swelling and great relaxation of the mucous membrane, which may be intensely congested and œdematous. The mucous follicles are often swollen, and the mucous membrane is usually covered with a secretion of dirty-looking, dryish, sticky mucus. The uvula also is elongated and swollen. Suppuration (suppurative pharyngitis) is apt to occur in enfeebled persons as well as in severe traumatic cases. Ulceration (ulcerative pharyngitis or ulcerated sore throat) frequently occurs, especially in septic cases.

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* *Ther. Mntsh.*, Sept. 1890, p. 469.

The most common *cause* of the simple forms of acute pharyngitis is exposure to cold and damp: the ulcerative forms (when not specific) are usually caused by breathing a septic atmosphere, as in the so-called "hospital throats," "drain throats," etc. Pharyngitis may, of course, be caused by contact with mechanical and chemical irritants in the solid, liquid, or gaseous form; or may be excited by the contact of highly-heated steam or other hot fluid or solid substances. It accompanies most of the exanthemata, and in scarlet fever occasionally assumes a very serious aspect. It is sometimes epidemic, and may accompany epidemics of true diphtheria.

The *symptoms* commonly complained of are heat, dryness, tension, and uneasiness in the throat; some dysphagia, slight modification of the voice, and occasional hoarseness. There is usually some fever, and in some persons, if the temperature is taken in the mouth, it will be found out of all proportion to the general constitutional state. We have often observed a temperature as high as 104° F. for a few hours during the height of the inflammation; 101° to 102° is, however, far more common. In cases which are referrible to chill there is often complaint of pains or aching in the back and limbs; the cervical glands are occasionally swollen.

The **treatment** of the milder cases of superficial pharyngitis is simple. Confinement to the house and the strict avoidance of exposure to cold currents of air is essential. If the bowels have not been freely relieved, and if the tongue and mouth are foul and sticky, a saline aperient should be given—a seidlitz powder, or 1 to 4 ounces of Dinneford's fluid magnesia with a teaspoonful of lemon-juice, will often be sufficient. This is often, however, advantageously preceded by a pill of 1 grain of calomel and 2 grains of extract of henbane. If there has been troublesome constipation before the attack a stronger dose will be needed, and an ounce and a half of the mistura sennæ composita may be ordered. If the attack has been brought on by exposure to cold and damp, and is accompanied by pain and aching in the limbs, a diaphoretic draught should be given at bed-time and the patient be enjoined to keep his room for at least a day or two. This draught may consist of—

℞ Salicinæ	15 grains.
Liq. ammonii acetatis	3 drams.
Spr. ætheris nitrosi	1 dram.
Aquæ camphoræ	ad 1½ oz.

M. f. haust. To be taken at bed-time.

If there is much *pain* in the throat, an eighth to a sixth of a grain of acetate of morphine may be added to this draught. In young children, if there is a high temperature, tincture of aconite or granules of aconitine ($\frac{1}{480}$ grain), given in the manner already described for tonsillitis, will often act remarkably well.

In septic cases, with much depression of strength as well as fever, we prefer, after the bowels have been relieved, to give quinine and potassium chlorate in effervescence, as follows :—

℞ Potassii chloratis	10 grains.
Potassii bicarb.	20 ,,
Ammonii carb.	5 ,,
Syrupis aurantii	1 dram.
Aquæ	ad 1 oz.

M. f. haust. To be given every three or four hours with the following powder :—

℞ Quininæ sulphatis	1½ to 3 grains.
Acid. citrici	20 ,,

M. f. pulv.

Half these doses can be given to children between seven and fourteen years of age. The dryness and heat of the throat may be relieved by sucking fragments of ice or sipping iced lemonade. A cold compress applied to the throat is also useful.

The diet should be light and nourishing, and may consist of milk, of whipped eggs, of oatmeal gruel, of broths, beef-tea, fruit jellies, and the like. When there is much relaxation of the mucous membrane, and much sticky mucus hanging about the throat, great comfort is experienced from the use of an alkaline and astringent gargle such as the following, which cleans away the mucus and braces up the relaxed mucous membrane:—

℞	Sodii bicarb.	1 dram.
	Glycerini boracis	1 oz.
	Potassii chlor.	2 drams.
	Tinct. catechu	2 „
	Aquæ rosæ	ad 12 oz.

M. f. garglo.

In cases of intense inflammation, with much swelling of the mucous membrane and great pain, so that gargling is not possible, a steam spray of warm water containing 5 grains of sodium bicarbonate and 2 or 3 of sodium chloride, and, if necessary, $\frac{1}{2}$ grain of extract of opium to the ounce, is very comforting.

After cleansing the throat of adherent mucus by a warm alkaline gargle, great comfort may often be given by the application of a 10 per cent. solution of **cocaine** by means of a large camel-hair brush.

Later, when the relaxation of the mucous membrane is chiefly distressing, sprays containing alum (5 grains to the ounce) or tannin (5 to 10 grains to the ounce), with or without ammonium chloride (5 to 10 grains to the ounce), may be used with advantage.

In some low forms of ulcerative (septic) sore throat, vigorous tonic treatment may be needed, and a mixture containing 2 or 3 grains of quinine and 15 or 20 minims of tincture of perchloride of iron should be given every four or five hours. Three or four glasses of sound port wine are often also needed daily. In these cases the throat should be washed out (the attempt to gargle is too painful) with an antiseptic wash, a saturated solution of boric acid to which a little tincture of eucalyptus is added will answer the purpose.

The application of a very strong solution of nitrate of silver (40 grains to the ounce) once daily, after drying the surface of the pharynx with a pledget of absorbent cotton, has been advocated by Sajous,* but these applications have lost favour in England, and we do not think they are needed in ordinary acute cases. Spraying the pharynx with ether is another suggestion that would not commend itself to many physicians for use in private practice. The inhalation of vapour of benzoin given off from very hot water charged with about 5 per cent. of the tincture is soothing, but of no great curative efficacy.

Salol has been given in acute pharyngitis, and also in acute tonsillitis, by Gougenheim and Coupard, and by Jonathan and Wright, and they report † favourably of its action in cutting short these affections. They gave to adults at least 60 grains a day, either in *cachets* or in a mixture with mucilage and water; *e.g.*

℞	Salol	60 grains.
	Mucilaginis acaciæ	1 oz.
	Aquæ camphoræ	ad 4 ,,

M. f. mist. Two tablespoonfuls every six hours.

Chronic pharyngeal catarrh (*chronic sore throat*).—This has been divided into two varieties according as the glandular *follicles* are or are not conspicuously affected. In the latter case we have (1) *simple chronic catarrhal* sore throat, and in the former (2) we have *follicular* or *granular* pharyngitis, or clergyman's sore throat.

The chronic form of *catarrhal* sore throat usually follows repeated attacks of the acute disease, and has, therefore, the same etiology. The *follicular* form is predisposed to by sedentary occupations and unhealthy habitations, and the exciting causes are usually excessive use of the voice in speaking and singing, or local irritation from tobacco or alcohol, or food and drinks too highly spiced or too hot, or too hot and too cold together. It sometimes follows acute pharyngitis, and sometimes seems to be chronic from the outset. It is common in the scrofulous and not infrequent in the rheumatic and gouty.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 445.

† *American Journal of Medical Science*, Aug. 1890, pp. 158—165. *Les Noveaux Remèdes*, Oct. 8, 1890, p. 453.

In *follicular* pharyngitis the pharynx is seen covered with small projections varying in size from that of a pin's head to three or four times this size. Patches of dirty yellowish or brownish adherent mucus also cover the surface of the mucous membrane. In very old cases of this kind, when atrophy of the glandular structures has taken place, we get a variety known as *pharyngitis sicca* or *atrophic* pharyngitis (dry catarrh). In these cases a scanty, dry secretion is seen covering the thin, hard, glazed mucous membrane.

The **symptoms** complained of in chronic pharyngeal catarrh are an uncomfortable sticky feeling in the throat, with a constant desire to "clear the throat" by coughing or "hacking." There is usually more or less expectoration, and if this is dry and sticky, and not easily detached from the mucous membrane, there may be a good deal of dry irritative cough. The cough is often troublesome on lying down at night, especially when the catarrhal condition extends into the posterior nares. This, we believe, is caused by the larynx, in the horizontal position, falling back against the posterior wall of the pharynx, so that the excessive secretion from the catarrhal mucous membrane *drains*, as it were, into the larynx, or hangs about the glottis and excites efforts at coughing to get rid of it. The voice is often thick and coarse, and the throat gets "fatigued" after much vocal exertion, as in public speaking, singing, etc.

In the **treatment** of chronic pharyngitis, improvement of the general health must be our first consideration. If there is co-existent gastric catarrh we must endeavour to remove this by careful attention to diet and habits and a proper regulation of the bowels. Strong alcoholic drinks and all hot and irritating articles of food must be forbidden, as well as the use of tobacco, which undoubtedly is the cause of much troublesome catarrh, both gastric and pharyngeal.

If there is chronic constipation, a small pill containing half a grain of powdered ipecacuanha, a grain of aloes, and half a grain of soap, should be taken daily immediately before dinner, and a tumblerful of hot Carlsbad water should be drunk the first thing in the morning. This will cleanse the stomach of adherent mucus and promote its healthy secretions. It is an excellent plan also to drink and at the same time gargle the throat with a warm alkaline water about an hour before each meal—Ems or Vichy water will do.

In scrofulous conditions, as soon as the tongue is clean and the stomach in good order, we should give cod-liver oil and syrup of the iodide of iron, and in anæmic and debilitated cases quinine and strychnine and tincture of the perchloride of iron. In some gouty and rheumatic cases small doses of iodide of potassium with a bitter vegetable tonic will be of use, and in others the alkaline and arsenical Bourboule water will be found of great service; 4 to 6 ounces should be drunk *warm* night and morning, and an hour before dinner; it should be drunk slowly and kept in contact with the throat while swallowing. Topical astringents are of great value in many cases, but they should not be applied until the throat has been first cleansed from adherent mucus by gargling with a warm alkaline solution.

Whatever may be said to the contrary, the free application of a solution of nitrate of silver from 3 to 10 grains to the ounce, in that form of chronic pharyngitis which follows acute attacks, is exceedingly useful. A solution of chloride of zinc, 5 to 10 grains to the ounce, is also an excellent application, applied daily to the throat with a large soft brush. Some apply a mixture of nitrate of bismuth with glycerine, 10 grains to the ounce, with a brush, and find it relieves the local discomfort; a solution of tannin in ether has been recommended by others. It is said to answer admirably in some cases, as it leaves a thin film of tannin on the surface. All these applications require to be made by the medical man; it is necessary, therefore, to have other resources which we can entrust to the patients themselves. Sprays are very useful for this purpose. Tar-water applied in this way often renders good service; or a warm solution of borax (8 to 10 grains to the ounce), or a solution of sodium bicarbonate and ammonium chloride of the same strength. In mild, chronic cases gargles are of much service. An ounce of glycerine of borax and half an ounce of tincture of myrrh with 12 ounces of rose-water make a pleasant and useful gargle.

If the mucous membrane and uvula are much relaxed a good astringent gargle may be made with 5 drams of glycerine of alum, 20 minims of tincture of capsicum and 8 ounces of compound infusion of roses.

There are many useful forms of lozenges for these cases; some serve to detach the sticky mucus and promote expectoration and so relieve cough, such as the ammonium chloride lozenges, the Soden pastilles, and the pastilles Dethan (a French chlorate of potash lozenge flavoured with benzoin). Or the astringent lozenges are more useful in other cases, such as the red-gum lozenge, the rhatany, catechu, and tannin with capsicum lozenge.

Old cases of *follicular* pharyngitis are exceedingly difficult of cure. Some specialists recommend applications of very strong solutions of nitrate of silver (1 dram or 2 drams to the ounce), or iodine and carbolic acid (1 dram of each to an ounce of glycerine). The dilated capillaries are said to be sometimes benefited by the local application of the liquid extract of ergot, or a solution of ergotine (10 to 20 grains to the ounce). The local destruction of the enlarged follicles is also a favourite method of treatment, either by such caustics as solid nitrate of silver, or chloride of zinc, or caustic potash, or the incandescent electric cautery.

We have found in the less inveterate cases much service from the use of Bourboule water, as described above, or the Eaux Bonnes, or the Cauteret water. We have also had good results from a course of treatment at these places. Excellent results are also reported by the physicians at Aix-la-Chapelle, especially from the use of inhalations of the combined spray and vapour of their saline sulphur water. At the same time general tonic treatment is always indicated.

The following has been recommended as a good prophylactic application in "threatened" sore throat.

℞ Acidi tannici	12 grains.
Tinct. iodi	5 minims.
Acidi carbolici	30 grains.
Glycerini	½ oz.
Aquæ	ad 3 „

M. f. lotio. The throat to be painted with this three times a day.

ADDITIONAL FORMULÆ.

Tonic mixture for ulcerative stomatitis.

℞ Potassii chloratis, ½ oz.
Tinct. ferri perchlor., ½ oz.
Glycerini, 1 oz.
Aquæ destill. ad 12 oz.

M. f. mist. A tablespoonful four times a day in a little water. (*Whitla.*)

Mouth-wash for spongy gums.

℞ Tinct. myrrhæ, ½ oz.
Tinct. krameriæ, ½ oz.
Tinct. cinchonæ, ½ oz.
Tinct. catechu, ½ oz.
Eau de Cologne, 1 oz.

M. A large teaspoonful in a wineglassful of water, to be used as a mouth-wash frequently. (*Whitla.*)

Mixture in acute pharyngitis.

℞ Liquor. ammonii acetatis, 2 oz.
Spirit. ætheris nitrosi, 4 drs.
Tinct. veratri vir., 16 mins.
Aquæ camphoræ ad 8 oz.

M. f. mist. A tablespoonful every two hours. (*Whitla.*)

Gargle or spray for acute pharyngitis.

℞ Acidi carbolici, 1 dram.
Cocainæ hydrochlor., 8 grs.
Glycerini boracis, ½ oz.
Aquæ rosæ ad 12 oz.

M. f. gargar. (or spray). (*Whitla.*)

Gargle for acute pharyngitis and tonsillitis.

℞ Tinct. belladonnæ, 30 mins.
Glycerini, 2½ drams.
Decoc. althææ ad 6 oz.

M. f. gargar. (*Schnitzler.*)

Application for chronic pharyngeal catarrh.

℞ Iodi puri, 3 grains.
Potassii iodi, 30 grains.
Glycerini, 5 drams.

M. f. pigmentum. To be applied to the throat. (*Schnitzler.*)

Insufflation for pharyngeal ulcers.

℞ Iodoformi, 2 drams.
Coffeæ pulv., 2 drams.

M. f. pulv. (*Schnitzler.*)

Cocaine paint for pharyngeal hyperæsthesia.

℞ Cocainæ hydrochlor., 3 grs.
Glycerini, 30 minims.
Aquæ destill., 2 drams.
M. f. pigmentum.
(*Schnitzler.*)

Gargle in catarrhal pharyngitis.

℞ Acidi borici, 75 grains.
Glycerini, ½ oz.
Aquæ ad 10 oz.
M. f. gargar. (*Schnitzler.*)

Gargle in catarrhal pharyngitis (angina).

℞ Alumenis, 1½ dram.
Tinct. opii, ½ dram.
Mellis, 2 drams.
Syrupi rosæ, 3 drams.
Aquæ ad 8 oz.
M. f. gargar. (*Bamberger.*)

Mouth wash for mercurial stomatitis.

℞ Potassii chlorat., 2 drams.
Tinct. opii, 20 minims.
Aquæ laurocerasi, 1 oz.
Aquæ ad 6 oz.
M. f. lotio. (*Gosselin.*)

Astringent gargle for relaxed throat.

℞ Alumenis, 4 drams.
Acidi tannici, 1 dram.
Mellis, 1 oz.
Aquæ rosæ ad 8 oz.
M. F. gargar. (*Pressat.*)

Gargle for chronic pharyngitis.

℞ Glycerini acidi carbolici, 3 drams.
Acidi tannici, 2 drams.
Tincturæ capsici, 1 dram.
Infusi rosæ acid. ad 12 oz.
M. f. gargar. To be used frequently. (*Whitla.*)

Gargle for irritable granular pharynx.

℞ Ammonii bromidi, 2 drams.
Cocainæ hydrochlor., 10 grs.
Glycerini acid. carbol., 4 drs.
Aquæ rosæ ad 10 oz.
M. f. gargar. (*Whitla.*)

Gargle in chronic pharyngitis.

℞ Ammonii chloridi puri, 1½ dram.
Mellis, 1 oz.
Syrupi rosæ, 1 oz.
Aquæ ad 14 oz.
M. f. gargar. (*Bamberger.*)

Application for aphthæ.

℞ Boracis, 1 dram.
Amyli pulv., 1 dram.
Glycerini, 5 drams.
M. f. applic. (*G. Sée.*)

Gargle in mercurial salivation.

℞ Boracis, 2 drams.
Tinct. myrrhæ, 4 drams.
Mellis, 4 drams.
Aquæ rosæ ad 8 oz.
M. f. gargar. (*Brande.*)

CHAPTER II.

TREATMENT OF DISEASES OF THE ŒSOPHAGUS.

Acute Œsophagitis—Symptoms—Indications for Treatment—Spasmodic Stricture, or Œsophagismus—Causes and Symptoms—Treatment—Organic Stricture—Causes—Symptoms—Treatment—Dilatation—Tubage—Gastrostomy—Note on Rectal Feeding.

Acute Œsophagitis.

This is a comparatively rare disease except in association with the swallowing of irritant substances such as caustic poisons, or direct mechanical injury. It may occur as an extension downwards of an acute pharyngitis or upwards of an acute gastritis, but its importance and treatment would be then subordinate to that of the original disease; the same remark applies to its occurrence as an extension of diphtheria, or as a complication of certain acute specific diseases.

The chief **symptom** of acute inflammation of the œsophagus is dysphagia. Pain is felt along the course of the tube, which may be intensified, if ulceration has occurred, at one particular spot. Attempts at swallowing food may be so painful as to excite spasm and the ejection of the food mixed with mucus, and possibly blood, pus, or shreds of membrane. Thirst and feverishness accompany these symptoms.

The *indications* for **treatment** in this affection are to relieve pain and allay irritation and spasm. Opium must be given to relieve pain, and it may be administered in the form of hypodermic injections of morphine, but if swallowing is at all possible the local contact of a solution of opium with the inflamed mucous membrane is calculated to be very soothing. A solution of cocaine may also be swallowed, if swallowing is possible, or a combination of cocaine and opium. A teaspoonful of iced fluid containing a ¼ grain of extract of opium and ¼ grain of hydrochlorate of cocaine dissolved in it may be placed in the mouth and slowly swallowed, every quarter of an hour, until four to six doses have been taken, or cocaine lozenges may be slowly sucked. Another suitable medicine which may be given, after the preceding, is a mixture of oxychloride of bismuth with tragacanth emulsion and a small quantity of opium; this would afford some sort of protective, soothing covering to the inflamed mucous membrane.

Food must be given in the form of nutrient enemata so long as the dysphagia is severe. The thirst may be allayed by sucking bits of ice, and as soon as a little iced milk or cream can be taken it should be given. A milk diet should be maintained, or a diet composed of wholly unirritating fluids, until all undue sensitiveness or dysphagia has passed away.

STRICTURE OF THE ŒSOPHAGUS.

Stricture of the œsophagus may be either spasmodic or organic.

1. **Spasmodic stricture, spasm, or œsophagismus.**—Spasmodic contraction of the muscles of the œsophagus arresting the passage of food and drink into the stomach is a neurotic affection, often, but not always, associated with hysteria. We have ourselves observed it most frequently in males, associated with symptoms of the gouty or rheumatic diathesis. Often the exciting cause is hasty eating of indigestible food or drinking too hot or too cold fluids. Sometimes it will occur on attempting to join in a social meal, and the patient is obliged on that account to avoid eating except in private.

The attacks may occur frequently, or long intervals may occur between successive attacks. The attacks sometimes come on quite suddenly and at the beginning of a meal; at other times after more or less dyspepsia from some error in diet, it occurs on the next attempt to take food. Sometimes the spasm is complete, and neither fluids nor solids can be taken; at other times fluids can be swallowed, but not solids. Sometimes the spasm is only excited by certain kinds of food.

Occasionally much flatulent distension of the stomach and abdomen accompanies the attack. Persistent attempts at swallowing are generally attended by forcible rejection of the food, or it gives rise to severe pain. Exploration with a bougie will usually detect the stricture either at the upper or lower end of the gullet, and sometimes at both ends. When at the upper end the bougie can generally, with a little steady pressure, be made to pass through the constriction, but it is often far more difficult to overcome the stricture when at the lower end. In some cases it passes easily.

The general nutrition is often greatly disturbed, and such patients have frequently a thin and wasted aspect.

The **treatment** of this affection must be determined, to some extent, by the particular constitutional state of which it is the expression. In purely neurotic or hysterical cases anti-spasmodics and nerve sedatives must be given. The bromide of ammonium in combination with valerian is very useful; asafœtida, camphor, musk, valerianate, and oxide of zinc, belladonna, have all been suggested. A *cocaine* spray would probably be useful when the spasm is limited to the upper part of the gullet. In the intervals cold douches to the neck and upper part of the spine are calculated to improve the nerve-tone and prevent recurrences.

In gouty and dyspeptic cases, antacids and saline aperients are useful, and these patients can often be got to swallow a dose of medicine when they reject everything else. Local treatment is of great service, and the systematic passage of the bougie will often effect a rapid cure. If there is much hyperæsthesia the tip of the bougie should be dipped in a strong solution of cocaine. It is often desirable to make the patient take food in the presence of the physician, it gives him confidence and overcomes his nervousness. The passage of the bougie, or stomach tube through which the patient can be fed, should be repeated from time to time until the tendency to spasm has been completely overcome.

The diet, in dyspeptic cases, must be carefully looked to, and those articles of food that have been known to excite spasm should be avoided. The food should be simple, nutritive, and easy of digestion; it should be always thoroughly masticated and eaten slowly and deliberately.

Electrical stimulation of the vagus and counter-irritation along its course or along the spine, as suggested by some physicians, have not appeared to us to be of any real service.

2. **Organic stricture.**—Stricture, or narrowing of the œsophagus, may be caused by any injury which produces loss of substance, ulceration, and subsequent cicatrisation of its coats; as by caustic substances swallowed accidentally or purposely, or by mechanical injury, or wounds in whatever manner inflicted. Stricture of the œsophagus may also arise from syphilis. It is said to arise occasionally from hypertrophy of the muscular and connective tissue, caused by the chronic œsophagitis of spirit drinkers. The presence of morbid growths (cancerous, papillomatous, or fibroid) in the œsophagus may be the cause of stricture. The œsophagus may also be compressed from tumours arising external to it, as from enlargement of the thyroid body, or of the cervical or bronchial or mediastinal glands; from cervical or mediastinal abscesses or cancerous or other tumours; from aneurisms; from exostoses.

Stricture may occur in any part of the œsophagus, but is most frequent in the lower third. Above the constriction the walls are thickened and the *canal dilated*—below it, on the contrary, the walls are usually thinned and the canal collapsed.

The characteristic **symptom** of œsophageal stricture is *difficulty* in swallowing. When the constriction is only slight this difficulty may not be constant, and may only occur when large masses of solid food are passed into the gullet; small quantities of quite soft food and fluids may pass easily. As the stricture grows narrower difficulty may be experienced in every attempt at swallowing—more, however, at one time than another—but small portions of well-masticated solid food may still be swallowed with no great difficulty if washed down with some fluid. As the disease advances, however, the deglutition of all solids becomes impossible, and only fluids can be swallowed; and finally, in incurable cases, this may also become impossible. Together with dysphagia there is usually regurgitation of the food mixed with frothy mucus, and as the œsophagus often *dilates* into a pouch of considerable size above the stricture, food may be retained there for some time and regurgitated in a state of decomposition. Food regurgitated from the œsophagus is usually *alkaline*, unlike that regurgitated from the stomach, which is acid. If the obstruction be cancerous, fragments of the morbid growth, with pus and blood, and brownish and frothy mucus, may also be discharged with the regurgitated food. Great emaciation and obstinate constipation are usually present, and other symptoms may appear, not peculiar to this disease, but dependent on the special cause, which may be giving rise to pressure on adjacent structures. The attempt to pass an œsophageal bougie will demonstrate the existence of the stricture, and its situation and extent.

The **treatment of stricture** of the œsophagus, when of a non-malignant and cicatricial character, consists in attempts at dilatation by the passage of bougies gradually increasing in size. Great care must be used in passing these instruments, and no attempt at forcible dilatation must on any account be made until we are assured that the stricture is not due to carcinomatous disease or to external pressure as of aneurism. In such cases any attempt at the forcible passage of a bougie may be attended by very serious results. If attempts at mechanical dilatation are well borne, instruments for this purpose may be passed daily, or on alternate days, or at longer intervals, according to the toleration of the patient. The dilating sound, or bougie, should be retained in the canal for a few minutes, and when withdrawn an instrument of still larger size should be introduced for a moment and then removed. This last dilator should, preferably, be hollow like a stomach tube, so that a meal of fluid or semi-fluid food can be given by it, and the œsophagus thus kept quite at rest for some hours. When the canal has been sufficiently dilated to allow of free deglutition, the frequent performance of the operation may be discontinued; but the bougie should be still passed from time to time, every week or so, to ascertain that the dilatation is maintained. Continuous dilatation has been maintained by passing a tube through the nose and retaining it in the œsophagus for weeks and months. More risky measures which have been suggested and employed are (1) forcible dilatation by a double-bladed metallic sound; (2) destruction of cicatricial tissue by caustics; and (3) division of the stricture by internal œsophagotomy.

Iodide of potassium may be given in cases in which a syphilitic origin seems possible.

In cancerous cases opium will be needed to relieve pain. Small pills composed of opium and creasote or thymol are useful, both for their anæsthetic and antiseptic properties; or hydrochlorate of cocaine may take the place of opium if it seems desirable. The following is the formula for these pills :—

℞ Opii extracti (*vel* cocainæ hydrochlor.), 3 grains.
Creasoti, 3 minims (*vel* thymol, 6 grains).
Pulv. saponis, q.s.
Ut f. pil. 12. One every hour to relieve pain.

These small pills will dissolve in the œsophagus; they may be swallowed with a teaspoonful of iced water.

Hypodermic injections of morphine may be necessary in many cases. The continuous administration of **arsenic** in small doses is credited with the power of retarding the progress of malignant disease, and there can be no objection to trying it in these cases. Small pilules of arsenious acid ($\frac{1}{60}$ grain) or of arseniate of soda ($\frac{1}{24}$ grain) may be taken twice or three times a day.

The food in these cases must be adapted to the powers of deglutition or to the capability of introducing a feeding-tube into the stomach. So long as milk and fluid foods can be introduced into the stomach, the life of the patient may be sustained in this way; but when the stricture becomes absolutely impassable, feeding by nutrient enemata must be resorted to. It will, indeed, generally be necessary to have recourse to occasional feeding by the rectum some time before the stricture has become quite impassable; and it has been often noticed that after three or four days of exclusive rectal feeding, together with rest in bed, the patient has been again able to take fluid food by the œsophagus.

During the course of these cases the bowels will require to be relieved by enemata, and it is a good plan to early establish the habit of washing out the bowel daily with a pint or pint and a half of water having a teaspoonful of common salt dissolved in it.

In cases of malignant stricture, when it is no longer possible to swallow even fluid food, either of two resources may be adopted in order to prolong life. These are (1) the method of *tubage* as suggested by Dr. Krishaber, of Paris,* and modified by Mr. Charters J. Symonds, of Guy's Hospital; and (2) *gastrostomy.*

Mr. Symonds'† method is to pass through and retain in the stricture a short, funnel-shaped tube, the upper expanded part of which rests on the top of the strictured portion of the canal. It is passed down to the stricture by means of an ordinary conical bougie fitted into the funnel, and after the funnel-tube is fixed in the stricture the bougie is withdrawn, a strong silk thread having been previously fastened to the funnel end of the tube long enough to extend beyond the mouth and to be looped over the ear, behind which it is fixed by a piece of strapping. These tubes are made of gum elastic;* they are 6½ inches long, the funnel end is ½ to ¾ inch in diameter; it ends in an ordinary catheter end and eye. Mr. Symonds maintains that this tube has proved of the greatest service in the treatment of malignant stricture of the œsophagus, upon which its pressure produces no irritating or injurious effects. It is prevented slipping down through the stricture by the silk cord attached to it, as well as by the funnel expansion, and by means of the cord it can be easily withdrawn. Its advantages over the long tube projecting from the mouth are obvious; it is not unsightly, it does not interfere with deglutition in any way, it does not irritate the larynx, and it does not cause a constant escape of saliva from the mouth. In the first case reported by Mr. Symonds the patient was kept alive for eight months in comparative comfort, and never felt any inconvenience from the tubes; the stricture dilated considerably, and no injurious effect could be traced to its pressure on post-mortem examination. In the latter stages of the disease it was necessary to remove the tube frequently, as it became blocked with sputum and food. Twenty-four more cases have been reported by Mr. Symonds as having been treated by prolonged tubage. No unpleasant consequences had attended the wearing of the tubes; all the patients had improved, and life had been prolonged for periods varying from four to eleven months. The tubes do not usually require changing oftener than every three or four weeks; No. 12 or 14 is the size usually worn. They are durable, and the same tube and silk have been used for more than three months. Mr. Symonds appears to think that the use of these tubes will generally obviate the necessity of having recourse to gastrostomy, with its attendant dangers, and the distress from excoriation of the skin around the external orifice of the gastric fistula.

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* "De la sonde œsophagienne à demeure." *Transactions* of International Medical Congress, 1881, vol. ii. p. 392.

† *Transactions* of the Clinical Society, vol. xviii. p. 155, and vol. xxii. p. 307.

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* By Messrs. Down Brothers, St. Thomas's Street.

Dr. Arthur Kempe,* of Exeter, has used this method successfully in a bad case of syphilitic stricture situated four inches below the pharynx (which was also deeply ulcerated), in which no food had been swallowed for ten days. In less than three months the patient was able to swallow solid food easily.

Professor Annandale has also used retention tubes in treating stricture of the œsophagus, and patients who could swallow fluid with difficulty before, could, after the fixation of the tube in the stricture, swallow easily. He has used them with advantage in both malignant and non-malignant cases.

It is only, then, in cases in which the application of *tubage* seems quite impracticable that the operation of *gastrostomy* should be resorted to. It should also be always borne in mind, that although when first admitted into the hospital a patient may be quite unable to swallow, yet that after a day or two's rest in bed and the administration of nutrient enemata with opium, the power of swallowing will often be to some extent restored.

Mr. Mayo Robson has reported† a case of malignant stricture of the œsophagus in which gastrostomy appears to have prolonged life, in a state of comparative comfort, for nearly eleven months, during the whole of which time no food was taken except through the artificial opening in the stomach. At the time the operation was performed no food had been taken for several days, and on attempting to pass œsophageal bougies they were always arrested at a point 12½ inches from the teeth — not even the smallest could be got through the stricture. The operation consisted in making a vertical incision 3 inches long at the outer border of the left rectus, starting just below the costal margin. The parietal peritoneum was incised to the same extent and sutured to the skin margin. The stomach was then fixed to the abdominal wall by a method of suture which kept the peritoneal coat of the stomach in apposition with the parietal peritoneum in a continuous circle for some distance from the point where the stomach is to be opened. The insertion of two loops of wire marks the spot at which the stomach is to be opened, and by means of these wires the stomach can be manipulated whilst the silk suture is being applied. With a round needle, threaded with from 12 to 15 inches of moderately thick silk, a continuous suture is passed in the anterior wall of the stomach, in a circle of about 2 inches in diameter under the peritoneal coat, taking up a little of the muscular layer as well, the suture being made to emerge and leave a loop at every three-quarters of an inch of the circle, thus leaving about six loops protruding from the serous surface of the stomach (Fig. 1).

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* *British Medical Journal*, Dec. 27, 1890, p. 1480.

† *British Medical Journal*, June 7, 1890, p. 1295.

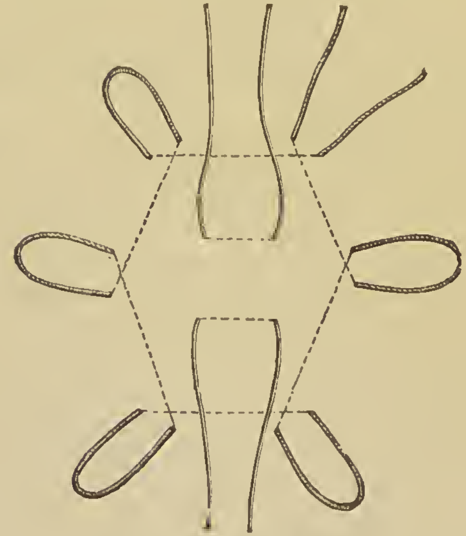

Fig. 1.—Gastrostomy: A Diagram to show Fixation of Stomach to Parietes. (*Greig Smith.*)

At corresponding situations on the skin, about half an inch from the edge of the wound, a handled needle with a hooked eye is pushed through all the layers of the abdominal walls, catches up the loops, and brings them to the surface of the abdomen one after another. As each loop is drawn up a piece of elastic tubing or a piece of catheter is slipped into it. The loops are then moderately tightened over the catheter by pulling at the ends of the silk. Finally, the ends of the silver suture are hooked under the catheter, serving to keep the exposed parts well up in the gaping wound (Fig. 2). It will thus be seen that by this method of fixing the stomach accurate peritoneal apposition is obtained over a large space, and the stomach is not dragged out too far, thus lessening the risk of a dribbling fistula. Moreover, the method is rapidly and easily carried out. The wound was dressed with sal-alembroth gauze, over which was placed a large pad of salicylic wool.

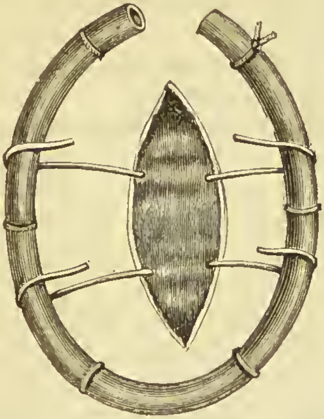

Fig. 2.—Method of fixing the Stomach to the Parietes in Gastrostomy. (*Greig Smith.*)

Nutrient suppositories and enemata were given alternately every four hours, and tepid water injected to relieve thirst.

The fourth day after the operation the stomach was opened by a tenotomy knife and a No. 4 catheter passed through the opening, and by means of a funnel and indiarubber tubing attached to the end of the catheter, 6 ounces of fluid were introduced consisting of 3 ounces of beef-tea, 3 drams of condensed peptonised milk, 3 ounces of brandy, and the rest water. He was fed in the same way with 10 to 14 ounces of fluid food, consisting of milk, beef-tea, yolk of egg, brandy, etc., every four hours. These quantities of food err rather on the side of excess.

About the tenth day after the operation the sutures were removed, and as a little gastric juice escaped a larger catheter was used. Subsequently a short celluloid tube with a stopper was fitted into the wound, which the patient could remove and replace himself, and by taking out the stopper he could feed himself through the opening.

Dr. David Newman, of Glasgow, has also reported a successful case of the same kind in which the operative procedure was similar,* and Dr. Handford of Nottingham brought before the Clinical Society of London † a like case in which the patient survived the operation 193 days, and took very large quantities of fluid and finely-divided food by the gastric opening—viz. six meals in twenty-four hours, the total amounting to 8½ pints of milk and water, 2 ounces of bread-crumb, 4 ounces of powdered raw meat, 5 ounces of cream, 2 eggs, and 1 ounce of brandy. It appeared only to be necessary that the food should be finely divided in order to be digested easily and rapidly. MM. Hartmann and Terrier, of Paris,‡ who strongly recommend early gastrostomy in malignant stricture of the œsophagus, observe the following procedures :—(1) To pass the sutures which fix the stomach to the external wound under the serous and part of the muscular coat without perforating the mucosa, so as to avoid septic inoculation along the threads ; (2) to make the opening as small as possible, and as near as possible to the superior curvature ; (3) to drag out the edge of the mucosa and to turn it over and stitch it to the edge of the skin, so that it forms a border around the artificial opening. If this method be practised the surgeon can, it is asserted, complete the operation at once, and without waiting for the formation of adhesions between the two layers of peritoneum. In considering the best way of preventing subsequent discharge of gastric juice from the artificial opening and troublesome erythema of the surrounding skin, Terrier's objections to the use of any kind of plug seem cogent. Such instruments have a tendency in most instances to cause dilatation of the fistula. If the gastric opening be small, it will remain a closed one, and allow no external discharge of the fluid contents of the stomach. Inert powders, such as carbonate of magnesia, should be used to dress the wound, as they are capable of neutralising any drops of gastric fluid that may be discharged during any forcible effort made by the patient.* It is no doubt best, when gastrostomy is the only means available to relieve the patient's distress and to prevent him from dying of starvation, a fate which absolutely stares him in the face, that the operation, in order to be successful, should be done before the patient's strength and endurance are exhausted.

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* *British Medical Journal*, May 9, 1891, p. 1023.

† October 23rd, 1891.

‡ *Bull. de la Soc. Anat.*, tome v. p. 117.

Note on feeding by the rectum.—We shall so frequently have to recur to the subject of rectal feeding that this seems the best place to offer a few remarks on that subject. It is important to remember that the lower part of the large intestine does not exert any *direct* digestive action on alimentary substances introduced into it. It can only absorb water and salts and predigested, *i.e. peptonised*, substances. It is, therefore, very doubtful, when enemata of beef tea and of milk are given, whether they are of any real nutritive value, as it is probable that only the water and salts are absorbed. They are stimulating, however, and allay thirst, and must not be regarded as useless. Wine and alcohol can also be absorbed by the large intestine.

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* Further and full details of the operative procedures needed in these cases will be found in Mr. Treves's "Operative Surgery," vol. ii. part x, chap. xiii.

But food given by the rectum in order to be absorbed should be *peptonised*, and it is also necessary that the rectum be washed out with an enema of tepid water before each nutrient injection. Nutrient suppositories are of doubtful value; we have known instances in which the large intestine has been found crammed with them on post-mortem examination. Nutrient enemata should be given by means of a long tube (not too flexible, or it may bend back on itself) passed as high up as possible, so as to be brought into contact with as large an extent of absorbing surface as practicable. We shall refer to some suitable forms of nutrient enemata in subsequent chapters (*e.g.* see foot-note, page 72). Dujardin-Beaumetz advises the following :—The yolk of an egg is beaten up with a glass of milk, and to this is added either two dessert-spoonfuls of solid peptones or two tablespoonfuls of liquid peptones, 5 drops of laudanum, and if the peptones are acid, 7 or 8 grains of bicarbonate of soda. The secretion of the large intestine is alkaline, and acids irritate it, and in cases where prolonged alimentation by the rectum is necessary all irritation of its mucous membrane must be carefully avoided.*

Catillon kept a dog alive in good condition for thirty-seven days by rectal injections consisting of, daily, two lavements, each composed of three eggs and a dram and a half of liquid glycerine of pepsine; given without the pepsine the dog wasted rapidly, and when this was replaced by fluid blood he rapidly sank.

Daremberg,† in a case of stricture of the œsophagus, kept a patient alive for fourteen months, and with a daily excretion of urea amounting to from 225 to 300 grains, by means of peptonised enemata made in the following manner: Into a glass or other suitable vessel introduce 7,500 grains of meat as lean as possible, minced fine; pour on this about 100 ounces of pure water and an ounce of hydrochloric acid of a density of 1·15. To this add 40 grains of the purest and best pepsine. Digest this mixture for four hours at a temperature of 112° F. Then pour it into a vessel of porcelain and let it boil, adding meanwhile a solution of bicarbonate of soda (17 grains to the ounce) until the mixture has a slight alkaline reaction; this will require 5 to 6 ounces of the solution. Strain the liquid through fine linen and express the insoluble residue; then concentrate the whole in a *bain marie* to 50 or 60 ounces. Half this is given by the rectum daily.

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* "Leçons de Clinique Thérapeutique:" De l'intestin au point de vue thérapeutique. Vol. i. p. 620.

† "De l'Alimentation par les Peptones." *Gaz. Hebd.*, 1879.

Ewald's observations on rectal feeding led him to the following conclusions:—(1) The absorbent power of the rectum is undoubted, but the quantity of food absorbed varies much, according to individual peculiarities and influences which cannot be brought under control. It is not purely a physical and chemical process independent of nervous influence. (2) The richness of an albuminoid in true peptone is no real criterion of its absorbability by the rectum. Eggs, which contain the smallest proportion of peptone, are rapidly absorbed and contribute to a much greater gain of the organism than the peptones of commerce, which contain from twice to five times as much peptone. (3) We can obtain the same effects as from peptones by using eggs prepared with hydrochloric acid and pepsine, and at half the expense. The addition of chloride of sodium is said (Huber) to promote the absorption of eggs in enemata, 15 grains to each egg.

The apparatus depicted on the next page (Fig. 3) is recommended for rectal feeding by Mr. Jones-Humphreys.* It consists of a small funnel, a piece of elastic tubing $\frac{1}{8}$th of an inch in diameter, a glass tube 4 inches long, by which the fluid can be watched descending; joined on to this is an ordinary flexible catheter. The fluid is slowly forced into the rectum by atmospheric pressure. Absorption, though slow, is said to be efficient. He claims for this method, simplicity (the patient being able to easily pass the catheter into the bowel himself), cheapness, and cleanliness. The slowness of the passage of the fluid he does not consider an objection, but the patient might!

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* *British Medical Journal*, April 26, 1890.

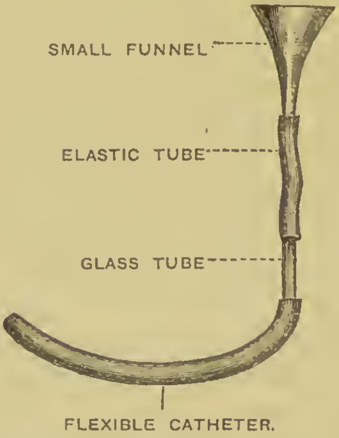

Fig. 3.—Apparatus for Rectal Feeding.

CHAPTER III.

DISEASES OF THE STOMACH—THE TREATMENT OF ACUTE AND CHRONIC GASTRIC CATARRH.

Acute Gastritis, or Acute Gastric Catarrh.—Causes—Symptoms—Indications for Treatment—Lavage—Emetics—Purgatives—Massage—Rest—Careful Diet—Ice-bag—Counter-irritation—Opiates and Sedatives—Alkaline Effervescents—Calomel—Care in Convalescence. Chronic Gastric Catarrh.—Causation—Symptoms—Indications for Treatment—Lavage—Purgative and other Mineral Waters—Antifermentives—Bismuth—Object and Use of Alkalies—Iron in Anæmic Cases—Hydrochloric Acid and Pepsine aperients—Dietetic Management. Additional Formulæ.

Acute Gastric Catarrh.

This disease has also been termed "inflammatory dyspepsia," and it *is* a form of dyspepsia inasmuch as it usually arises in connection with some difficulty in the process of stomach digestion. One of the most common predisposing causes of acute gastric catarrh is a defective secretion of gastric juice, which is either deficient in quantity or defective in quality; hence arises abnormal decomposition of the ingesta, owing to their undue detention in the stomach, and thus is set up irritative inflammation of the mucous membrane. Such a condition usually accompanies febrile maladies, and it also occurs in feeble and debilitated anæmic states; and so it happens that quite slight errors in diet will prove sufficient to excite an acute gastric catarrh in convalescents from exhausting diseases, and in the weak and anæmic. Ewald says "a convalescent patient gets acute gastric catarrh from a beef-steak, which the same man manages easily when he is well." He also believes in an inherited tendency to this affection.

Persons who have suffered from malarial affections, and gouty and rheumatic persons, are also predisposed to attacks of this disease. The *exciting* cause of attacks of acute gastric catarrh is commonly to be found in some error in diet. The food may simply be excessive in quantity, so that the gastric juice secreted is not sufficient to digest the whole of it, and the undigested residue undergoes abnormal decomposition within the stomach; or the food may be of coarse and indigestible quality, and the gastric mucous membrane may, at the same time, be constitutionally sensitive and irritable; or the food may be difficult of digestion on account of imperfect mastication, so that the gastric juice cannot penetrate it; or the same may be the case from the food being soaked with fat or rich sauces. Or the articles of food and drink may be in themselves irritating, from being too hot or too cold, or too pungent, or in a state of decomposition. The stronger alcoholic beverages are especially prone to set up gastric catarrh; too long use of certain medicines (arsenic especially); "catching cold" in certain persons; all these seem to be capable of exciting catarrh of the stomach.

The continued use of narcotics, such as opium, by diminishing both the secreting and the propelling force of the stomach may lead to retention and abnormal decomposition of the ingesta, and so excite gastritis.

The foregoing are the **causes** we shall chiefly have to bear in mind in considering the appropriate treatment of cases of acute gastric catarrh.

The **symptoms** which usually accompany this disease are the following:—

A sense of fulness and uneasiness in the stomach, with flatulent distension and tenderness on pressure over the epigastrium. A coated tongue, foul breath, a bad taste in the mouth, thirst, loss of appetite, increased flow of saliva, nausea, and "heart-burn," accompanied by eructations of sour, acrid, fœtid substances resulting from the morbid decomposition of food in the stomach. In severe cases there is vomiting, the vomited matters consisting of altered food, mucus, bile, and occasionally streaks of blood. If the catarrh of the mucous membrane extends to the duodenum there may be some icteric discoloration of the skin.

Sometimes there is constipation; at other times, when the catarrhal condition extends to the small intestine, there is diarrhœa. The urine is scanty and high-coloured, and deposits urates. In addition to the *local* symptoms there are usually general *malaise*, and bodily and mental depression, severe frontal headache, coldness of the extremities, and often patches of herpes on the lips. To *severe* cases of this kind with some rise of temperature and a quick pulse, the term "gastric fever" has often been applied. The depression and other nervous symptoms observed in connection with this malady may be due to the absorption of poisonous substances generated within the alimentary canal.

The **indications** for **treatment** in acute gastric catarrh are the following:—

1. To remove from the stomach any irritating substances that may be retained there.
2. To rest the inflamed stomach as completely as possible.
3. To administer only fluid, unirritating and easily absorbed food, in small quantities at a time.
4. To apply such direct remedies as will relieve the pain, hyperæmia, and irritation of the gastric mucous membrane, prevent morbid decomposition of the ingesta, and correct excessive acidity when it exists.
5. To enforce the observance of sound dietetic rules,* during and after convalescence, so as to guard against a return of this malady.

1. When it is evident that the gastric catarrh is excited or maintained by the presence of decomposing food in the stomach, means must be taken to remove it. In cases where there is obvious dilatation of the stomach, as well as acute catarrh, it will probably be best, by means of the stomach pump or the siphon tube,† to empty and then wash out the stomach with some warm weak alkaline solution, so as to detach

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* See the author's work on "Food in Health and Disease."
† See the chapter on Dilatation of the Stomach.

and carry away any sticky, ropy mucus which may be adhering to the mucous membrane. Ems or Vichy water, or a weak solution of bicarbonate of soda (2 grains to the ounce) will do for this purpose. When there are objections to, or difficulties in, the application of this method, it may be useful to give an emetic, especially in the case of young children and persons who vomit easily. From 5 to 20 grains of powdered ipecacuanha, according to age, in from one to four tablespoonfuls of warm water, will act well with most persons, and with care in the subsequent treatment it will rarely be necessary to repeat this. Some prefer to give a hypodermic injection of $\frac{1}{24}$th to $\frac{1}{12}$th of a grain of *apomorphine*, but it must be borne in mind that this drug is very depressing to some persons. In other cases we may succeed in emptying the stomach by means of mild purgatives, together with gentle manipulation or massage of the stomach; the pressure on the distended organ being directed from left to right, *i.e.* from the cardiac towards the pyloric end. By mild measures of this kind, together with complete abstinence from solid food, we may be enabled to empty the stomach of its contents in a manner perhaps more agreeable to the patient than by either of the preceding ways. A suitable aperient for children is the compound rhubarb powder, 10 to 20 grains, and for adults 1 or 2 drams of Carlsbad salts dissolved in warm water, twice a day. When we have succeeded in cleansing the stomach from all irritating contents we have

2. *To enforce rest of the inflamed organ.* In severe cases the entire exclusion of all food from the stomach for two or three days will be of great service. Nutrient enemata should be administered, the patient should be kept in bed, and allowed simply to sip iced water, or to suck small fragments of ice. If there should be any craving for food, or any restlessness or pain, a morphine suppository, or the addition of a few drops of tincture of opium to each enema, will usually relieve these symptoms.

When such complete abstinence is not indicated or is impracticable, then we must limit the food to bland nutritious fluids, given cold, and in small quantities at a time. A few spoonfuls every hour of equal parts of milk and lime water iced, or milk and Vichy water, or one or two tablespoonfuls of thin water arrowroot three or four times a day.

A strict diet of this kind will, when the patient is kept at rest in bed, suffice for a few days, and the stomach will be thus maintained almost in a state of complete physiological rest.

3. The third indication is practically a continuation of the second, and directs us to exercise the greatest caution in regulating the diet while the acute condition is passing away, giving only the lightest kinds of food in small quantity at a time, and if necessary in a predigested form.

4. The fourth indication applies especially to medicinal treatment. It is rarely necessary to abstract blood locally by applying leeches (two or three) to the epigastrium as has been suggested ; this measure may, however, be found useful occasionally in febrile cases with much local pain and irritability. A poultice should be applied after the leeches have been removed. The application of cold compresses or of the ice-bag to the epigastrium is a favourite remedy with some physicians. This measure, together with sucking small fragments of ice, is often efficacious in arresting vomiting, while it also relieves thirst. A mustard poultice to the epigastrium is sometimes useful and more agreeable to patients than the ice-bag. Pain must be relieved by opiates, or by a combination of opium and hydrocyanic acid, together with bismuth, which is an excellent gastric sedative. When the pain is acute a hypodermic injection of morphine, $\frac{1}{6}$ or $\frac{1}{4}$ of a grain, will be attended by immediate relief, and this is the best way of administering a narcotic in cases where the stomach still contains irritating substances. But when the stomach is known to be free from irritating contents, the irritation attending the

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inflammation of the mucous membrane is, perhaps, better allayed by giving opium by the stomach. The following is a suitable prescription for adults :—

℞ Bismuthi salicylatis (*vel* oxychloridi)	30 grains.
Extracti opii	2 ,,
Acid. hydrocyanici diluti	18 minims.
Sodii bicarbonatis	60 grains.
Mucilaginis tragacanthæ	1 oz.
Aquæ	ad 6 ,,

M. f. mist. Two tablespoonfuls every three or four hours.

When there is a great tendency to vomiting (without much local pain), and distressing thirst, effervescing drinks are often very useful and grateful to the patient. The following may be prescribed :—

℞ Sodii bicarbonatis	3 drams.
Aquæ laurocerasi	4 ,,
Aquæ	ad 8 oz.

M. f. mist.

℞ Acid. citrici pulv.	2 drams.

To be divided into eight powders. A powder to be dissolved in a tablespoonful of water, and added to two tablespoonfuls of the mixture, and taken while effervescing every hour or two.

The eructations of gas which follow the introduction into the stomach of such alkaline effervescent fluids are useful in bringing away other deleterious gases which may have collected there. The excess of alkali is also useful in neutralising the contents of the stomach when acid, and in loosening and detaching tough ropy mucus which may have accumulated on its surface. Indeed, if the patient complains of *sour* eructations we should give the alkaline carbonates freely to relieve this.

We must be cautious how we attempt to arrest the *diarrhœa* which occasionally accompanies such cases as we are considering. This is often a conservative measure, and carries away offending substances, and by unloading the tributaries of the portal vein it tends to reduce the hyperæmia of the gastric mucous membrane. Indeed, some physicians have recommended that it should be encouraged or induced by the administration of ipecacuanha and calomel. It has been advised* that ipecacuanha in 6- to 8-grain doses, with 1 or 2 grains of calomel, should be given three times a day to produce "healthy bilious stools" in forms of catarrhal gastritis with symptoms of portal congestion. The same author also recommends that 6 or 8 grains of calomel should be rubbed up with sugar of milk and placed dry on the tongue, and followed by a cooling saline aperient. Ewald also is "a great advocate" of calomel for this purpose.† In convalescence and in protracted anæmic cases it is often desirable to promote the activity of the gastric secretion by giving 3 or 4 grains of pepsin with 5 to 10 minims of dilute hydrochloric acid a quarter of an hour after each meal of animal food. Those rare cases of acute gastric catarrh which can be directly traced to the effects of chill should be treated by diaphoretics, rest in bed for a few days, and restriction of the diet to unirritating fluid foods.

5. Finally, there is the last important indication, which is directed to the avoidance of those errors in diet which may have originally provoked the malady. After recovery we should insist that only easily digested food be taken, in moderate quantity and at sufficient intervals; that the food be eaten slowly and thoroughly masticated. All excess of alcoholic stimulants, all rich entrées, all pastry, and all substances calculated to set up fermentation in the stomach, should be strictly forbidden. Any tendency to constipation must be overcome by regular exercise, or by an occasional aloetic pill or saline aperient.

CHRONIC GASTRIC CATARRH.

Chronic catarrhal inflammation of the mucous membrane of the stomach is frequently a sequel of one or more attacks of acute gastritis, and its causation must in such cases be referred to those influences which produce the acute affection. The chronic form of gastric catarrh is, however, especially prone to follow the abuse of tobacco and of alcoholic beverages, and particularly the use of ardent spirits; it is often due to the habitual indulgence in excess of food, or in articles of diet of a pungent, indigestible, exciting, and irritating character, or to the abuse of drugs. Briefly, errors in diet, long continued, are the chief causes of chronic gastric catarrh, which Ewald describes as "the best-fostered and widest-spread of this world's ills!" Those persons, also, who in their occupations are compelled to "taste" things, as wine "tasters," tea "tasters," and cooks, are subject to this disease. Feeble, anæmic, and chlorotic patients, with weak digestive powers owing to defective secretion of gastric juice, which is either deficient in quantity or defective in quality, and in whom the digestion of food is thereby retarded and the ingesta are detained so long in the stomach as to undergo morbid decomposition—these are also subject to chronic gastritis.

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* Pepper's "System of Practical Medicine," vol. ii. p. 469.

† "Lectures on Diseases of the Stomach," vol. ii. p. 501. Sydenham Society's translation.

It accompanies certain chronic diseases, such as phthisis and those disorders which are attended with obstruction in the portal system, as hepatic cirrhosis, or those chronic structural changes in the heart and lungs which lead to dilatation of the right side of the heart and obstruction to the outflow from the inferior vena cava. All these morbid states cause passive hyperæmia of the gastric mucous membrane, and so induce chronic gastric catarrh.

The **symptoms** which accompany chronic gastric catarrh resemble in many respects those of simple functional dyspepsia; but in the cases we are now considering these symptoms depend upon structural alterations in the mucous membrane of the stomach, —induration from proliferation of interstitial tissue, and degeneration from fatty change in the cells of the gastric tubules. The patient complains of loss of appetite, of a sense of weight, fulness, or even pain in the region of the epigastrium, increased by taking food. He has flatulent and acid eructations, accompanied by a sensation of heat or burning, extending from the stomach along the œsophagus to the pharynx, and commonly known as "heart-burn."

He often suffers from nausea, and occasionally from vomiting. The vomited or eructated matters are highly acid, and have been found to contain acetic and butyric, as well as lactic acids, and other abnormal products of morbid fermentation, including sarcinæ and torulæ.

In the chronic gastric catarrh of the alcoholic there is usually a morning vomit of watery fluid mixed with mucus, to which the term "pyrosis" or "water-brash" is applied. This consists chiefly of saliva swallowed during the night mixed with gastric mucus, the secretion of saliva in this complaint being often greatly increased. There is often considerable flatulent distension of the small intestine, due to the presence of food undergoing abnormal putrefactive changes; and although there is generally obstinate constipation, there may be occasionally diarrhœa from co-existing intestinal catarrh. If the catarrhal condition extends to the duodenum and affects the common bile-duct, the symptoms of jaundice may appear. The mouth is often foul, and the tongue dirty and flabby and indented by the teeth at its edges. This, however, is not always the case, and the tongue is not infrequently small, red, and pointed.

The *urine* usually deposits urates, as well as crystals of oxalate of lime, and occasionally it is phosphatic. The nervous system usually suffers considerably in well-marked cases. There are great mental as well as physical dulness and lassitude, great depression of spirits, accompanied with much irritability of temper, frequent headache, and now and then distressing attacks of vertigo. These nervous symptoms have been referred to the probable absorption of poisonous products of imperfect digestion. The cardiac rhythm is occasionally disturbed, and the heart's action becomes rapid and irregular. The general nutrition usually suffers considerably, especially in cases of long duration, as absorption from the mucous membrane of the stomach is interfered with by the presence of a layer of tough mucus on its surface, so that the patient emaciates and loses strength.

In the **treatment** of chronic gastric catarrh the first *indication* is to remove, if possible, the exciting cause of the catarrh. When it is due—as it so often is—to the abuse of alcohol, abstinence from alcoholic drinks must be insisted upon. When it is a consequence of those organic diseases of the liver, lungs, or heart, which lead to secondary engorgement of the mucous membrane of the stomach, the treatment which is beneficial to those diseases will be also remedial of the catarrh of the stomach. When it has been induced by obvious errors in diet, these must be corrected. When it is a consequence of debility and anæmia, tonics and blood restoratives must form part of the treatment. When it is associated with some incurable organic disease of the stomach itself, or has advanced to the condition of senile atrophy, palliative measures alone are possible.

Besides attending to the preceding indications for treatment, it is also necessary that we should adopt measures for arresting the morbid fermentations going on in the stomach, and for relieving the stomach of all decomposing substances and cleaning its mucous surface of the layer of tough, ropy, tenacious mucus which usually covers it and blocks, as it were, the orifices of the secreting tubules. Other indications are to relieve excessive acidity of the gastric contents, to allay existing irritation of its mucous membrane, and to preserve it from further irritation by great care in the choice of food and by enforcing such dietetic measures as shall insure to the stomach as much functional rest as is possible.

Let us now consider how the above indications may be best carried out in detail.

In aggravated cases where we have evidence of the retention of decomposing matters in the stomach, one of the most efficacious measures is to begin by emptying the stomach mechanically of its contents by means of the stomach pump or syphon tube, and at the same time **washing out** the stomach* with some weak warm alkaline solution; for this purpose we may use warm Vichy water, or warm water containing 2 or 3 grains of sodium bicarbonate and 5 or 6 grains of common salt to the ounce, or a weak solution of borax, 3 or 4 grains to the ounce. By this measure we shall not only effectually remove the irritating results of the abnormal fermentation of the food, but we shall also cleanse the mucous membrane of the stomach of the viscid mucus which adheres to it.

When the patient positively refuses to submit to mechanical treatment of this kind, or where we encounter other difficulties in carrying it out, other methods of emptying and cleansing the stomach may be adopted. An initial **emetic** of ipecacuanha or of apomorphine, as mentioned on page 48, may be administered; or a better process, in many cases, is to carry away the contents of the stomach through the intestinal canal and wash its surface at the same time by the prolonged and systematic administration of **purgative waters,** and especially of mineral waters like those of Carlsbad, Tarasp, and Marienbad, which contain the sodium sulphate. The alkaline carbonate neutralises alkaline sodium bicarbonate as well as the purgative the excessive acidity of the stomach contents, while the aperient sulphate sweeps them away through the intestinal canal without setting up any irritation of the intestinal mucous membrane. These waters must be given in the morning fasting in sufficient quantity to cause several watery stools; in this way the stomach is daily washed and cleansed of all lingering decomposing food and adhesive mucus.

Whenever practicable this treatment is best carried out at **Carlsbad** itself, where the strict diet enforced greatly contributes to the cure; but the same rules and method may be enforced and carried out at home with the frank and obedient co-operation of the patient.

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* The technique of this method is described in the chapter on the treatment of Dilatation of the Stomach.

After a time, or when it is clear that a decided aperient action is not needed, but the object is simply to cleanse the mucous membrane of the stomach of the morbid, viscid, catarrhal mucus with which it is covered, then the simple alkaline sodium bicarbonate waters such as warm Vichy, Ems, or Vals water, or simple hot water containing 2 or 3 grains each of sodium bicarbonate and of common salt to the ounce, may be used instead of the Carlsbad water. Two or three tumblerfuls should be drunk in the morning fasting, and no food should be taken till an hour after the last glass. "The results from this treatment," says Niemeyer, "are the most brilliant that are ever attained in medicine."

In some chronic, obstinate cases in neurotic, sensitive subjects, in which the symptoms are not very severe, but rather annoying and troublesome from their persistence, the gaseous chloride of sodium waters of Kissingen often prove most efficacious, and appear to agree better than the stronger aperient waters. Ewald considers the chloride of sodium waters indicated in the cases of chronic gastric catarrh with depressed glandular secretion.

If we use a simple bicarbonate of soda water, it will often be an advantage, especially in gouty subjects, to order a tumblerful as hot as can be drunk comfortably, to be taken half an hour or an hour before lunch and dinner and at bed-time; the object being to wash away all residual mucus or other substances remaining from the previous meal before another is taken, and also to neutralise any excess of acid which may remain in the stomach, and to stimulate a healthy secretion of gastric juice.

Other measures may at the same time be taken to check or arrest fermentive action in the stomach; two of the best remedies for this purpose are creasote and thymol, given in pills immediately after food. The latter may be presented in this form:—

℞ Thymol	1 grain.
Pulv. saponis	2 grains.
Spir. vini rect.	q.s.

Ut f. pil. To be taken twice or three times a day, immediately after food.

The following is a good form for giving creasote:—

℞ Creasoti	½ minim.
Pulv. rhei	āā 1½ grain.
Pulv. calumbæ	
Pulv. saponis	½ grain.

M. et f. pil. To be taken twice or three times a day, after food.

Resorcin has been advocated by some as preferable to creasote. It may be given in doses of one to three grains, made into a pill with sugar of milk.

In some irritative states of the stomach with pain and nausea after food, or when there is pyrosis, the preparations of **bismuth**—the subnitrate, the carbonate, and the oxychloride—are very useful. These preparations of bismuth not only act as antiseptics and antacids, but they also exert a useful astringent effect on the relaxed and engorged mucous membrane, and probably act also mechanically by affording a sort of protective covering to the irritated mucous surface. It is often advantageous to combine the bismuth with an alkali, especially when there is complaint of "heart-burn," together with acid eructations.

The following is a usual prescription:—

℞ Bismuthi subnitratis	āā 5 grains.
Magnesiæ ponderosæ	
Sodii bicarbonatis	

In a cachet. Three times a day.

Or it may be prescribed in a mixture, as follows:—

℞ Bismuthi oxychloridi (*vel* subnitratis)	10 grains.
Magnesiæ ponderosæ	āā 5 ,,
Sodii bicarbonatis	
Mucilaginis tragacanthæ	1 dram.
Aquæ menthæ pip.	ad 1 oz.

M. f. haust. To be taken half an hour before food, three times a day.

An excellent combination for the purpose of relieving the pain and nausea which so often accompany aggravated conditions of this malady is the following :—

℞ Bismuthi carbonatis	10 grains.
Acid. hydrocyanici dil.	5 minims.
Liq. opii sedat.	5 ,,
Mucilag. tragac.	1 dram.
Aquæ menthæ pip.	ad 1 oz.

M. f. haust. To be taken half an hour before food, or when in pain.

In advanced cases in which there is much irritability of the gastric mucous membrane, and pain after taking food, benefit may also often be derived from the administration of nitrate of silver in combination with small doses of opium. Given in a pill in doses of $\frac{1}{4}$ to $\frac{1}{2}$ a grain, combined with $\frac{1}{2}$ grain of extract of opium, half an hour before each meal, it will often have a valuable sedative effect.

In cases where we find much localised tenderness in the epigastrium the repeated application of small blisters has been found very serviceable.

In mild cases a cure may often be effected by careful regulation and limitation of food and by the judicious use of alkalies combined with vegetable bitters such as quassia, calumba, gentian, nux vomica, etc. The alkalies neutralise the morbid acidity of the stomach contents, and the bitters appear to give tone to the stomach, and both appear to promote the secretion of healthy gastric juice. They should be given about half an hour or an hour before a meal. The following prescription is a useful one :—

℞ Sodii bicarbonatis	15 grains.
Tinct. nucis vomicæ	10 minims.
Infusi calumbæ	1 oz.

M. f. haust. To be taken three times a day an hour before food.

It is important to understand thoroughly the object and right use of **alkalies** in the treatment of this disease. They are useful and necessary for the purpose of neutralising the acids, such as acetic and butyric, which result from the morbid fermentation of certain articles of food in the stomach, but they must not be given so as to neutralise the natural acid of the gastric juice. They are therefore best given at the end of the digestive process, and within a short distance of the next meal. At this time they answer other useful purposes; given in dilute solution warm, they dissolve and wash away, as we have already pointed out, the sticky morbid catarrhal mucus adhering to the gastric mucous membrane, and they also promote and stimulate the secretion of gastric juice for the approaching meal. But it is also not infrequently necessary to give alkalies in many troublesome cases of chronic gastric catarrh, even during the digestive process, to relieve the suffering that is often caused by the rapid and excessive morbid development of acids in the stomach. We should, however, give them with caution and in not too large doses, and it is best then to combine an insoluble with a soluble alkali, for the former will only dissolve in an acid medium, and so soon as the offending acid is neutralised, it will remain practically inert. A dose of 10 grains of sodium bicarbonate with 10 grains of *light* magnesia in an ounce of peppermint water is a good form for this purpose.

In anæmic cases, in which the gastric catarrh is due to an imperfect blood supply and defective secretion of gastric juice, it is often best to give a tonic containing iron and a few drops of dilute hydrochloric acid to restore the due proportion of acid in the gastric juice, soon after each meal. The following is a good form :—

℞ Ferri et quininæ citratis	5 grains.
Liq. strychninæ	3 minims.
Acid. hydrochlorici diluti	10 „
Aquæ	ad 1 oz.

M. f. haust. To be taken after food three times a day.

In such cases it may also be necessary to give a dose of pepsin at or immediately after meals.

In advanced *atrophic* cases, in which from wasting of the gastric glands there is a great deficiency of digestive secretions, and sometimes an almost entire absence of hydrochloric acid and pepsin in the stomach, the indication is to administer full doses of this acid, with or without pepsin, after taking food. Ewald, who seems scarcely sufficiently to appreciate the value of alkalies in many cases of this disease, is, on the other hand, a vigorous advocate of the free use of hydrochloric acid. "It not only," he says, "replaces the deficient secretion of the glands, and forms the necessary acid albuminates for peptonisation, but it prevents organic fermentations, or limits those already existing." He gives it "in as concentrated watery solution as possible; that is, as acid as the patient's mouth will stand, three or four times every quarter of an hour after eating," and continues this treatment "for months without any bad effect." Pepsin he only gives "in advanced cases of mucous catarrh and atrophy of the stomach," and this in large doses, 7 to 15 grains dissolved in hydrochloric acid and water, about fifteen to twenty minutes after meals.* We regret we cannot fully share Prof. Ewald's views as to the great advantages to be realised from these large doses of hydrochloric acid.

In cases that are not being treated by purgative waters, the tendency to constipation must be corrected, and the bowels kept freely open by some suitable aperient. A pill of 2 or 3 grains of extract of aloes with half a grain or a grain of ipecacuanha powder, or 5 grains of the compound pill of colocynth and henbane, should be given at bed-time, and occasionally a grain of calomel or 2 grains of blue-pill may advantageously be added. Some authorities think highly of the use of small doses of calomel in protracted cases of chronic gastric catarrh. "The one-fifth of a grain of calomel, combined with bismuth or bicarbonate of sodium, may be given for weeks without danger of salivation. Excellent results sometimes follow this treatment. In small doses calomel is undoubtedly sedative to the mucous membrane of the upper portions of the digestive tract."*

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* "Lectures on Diseases of the Stomach," vol. ii. p. 38.

In cases that appear to have been brought on by chill, a Turkish bath may be useful, together with cold affusion and friction of the surface; a flannel belt worn round the abdomen has been found an excellent preventive, especially in malarious districts. The action of the skin should also be promoted by the habitual use of warm clothing.

Finally we have to consider the **dietetic** management of these cases, which, it need scarcely be said, is of the first importance. It must be borne in mind that our object is to give the stomach as much functional rest as possible, and we must therefore give the minimum amount of food consistent with the due maintenance of the nutrition of the body, and we must give it in the most easily assimilable form. In very severe cases it may be desirable to give the stomach absolute rest for a time, and it may be necessary to support the patient for a few days exclusively by nutrient enemata, allowing only a little iced water by the mouth or iced Vichy water to allay thirst and neutralise acidity. Leube prefers the "pancreatic meat emulsion" for rectal feeding in such cases.†

Restriction to an *exclusively milk diet* has been strongly advocated in this malady, and it certainly proves of the greatest value in certain cases, allowing, as it does, a considerable amount of functional repose to the stomach, and moderating the acidity and irritating character of the gastric secretions, especially when we dilute the milk, as is often absolutely necessary, with an equal quantity of Vichy or Apollinaris water. We must, however, watch for individual idiosyncrasies with regard to this diet, as some patients digest milk with great difficulty. We must not give large quantities at a time, 3 ounces of milk with 3 ounces of an alkaline water every three hours will be enough at first. The constipation which is apt to attend such a diet should be corrected by a dose of Carlsbad salts—two or three teaspoonfuls in a tumblerful of hot water the first thing in the morning. *Buttermilk* in which the casein is already curdled and finely divided agrees with some persons better than fresh milk, and has been warmly advocated by some German physicians. It has been suggested * that in the alcoholic cases we should begin by prescribing the fermented milks—such as koumiss or kefir or galazyme—and then after a time, pure milk, from 3½ to 5 pints in the twenty-four hours, diluted with about 12 ounces of Vichy water.

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* Prof. W. H. Welch, "Pepper's System of Practical Medicine," vol. ii. p. 478.

† See the author's work on "Food in Health and Disease," p. 535.

Carbohydrates are generally best avoided in cases of stomach catarrh; they tend to undergo acetous and butyric fermentation and often greatly increase the morbid acidity of the gastric contents. A little crumb of stale bread or a little thin dry toast usually agrees best.

All *fats* and fat sauces must be rigidly forbidden, as they tend to the formation of fatty acids in the stomach, and by rendering the food more or less impermeable to the gastric juice, retard digestion. It is often of use, as soon as the patient is thought able to take solid food, to give a teaspoonful of glycerine of pepsin or of Benger's liquor pepticus with each meat meal. Great regard should be paid to *individual* peculiarities. Niemeyer has pointed out that certain dyspeptics digest salt and smoked meats better than fresh ones, and he accounts for this by the circumstance that those preserved meats are less readily decomposed than fresh meat.

The meals of these patients must be small in quantity, not bulky, and, as their digestive processes are often very slow, ample time must be allowed between the meals. The best and tenderest portions of the lean of meat, chicken, game, and the lightest kind of fish should be selected; and if the teeth are defective and mastication, in consequence, imperfect, it is necessary to give these in a finely-divided form. Small quantities of fresh vegetables and potato may be permitted, in the form of *purées.*

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* Dujardin-Beaumetz, "Leçons de Clinique Thérapeutique," vol. i. p. 517.

With regard to beverages, it is advisable to forbid alcohol altogether, as well as strong tea or coffee. If a little wine seems to be needed, a light Bordeaux or Rhine wine mixed with Vichy or Apollinaris water is the best. The plan of giving some alkaline water, warm, half an hour before food, such as Vichy, Vals, or Ems water, not only has the advantage of cleansing the mucous membrane of the stomach, as we have already explained, but it also tends to lessen the desire to drink while eating.*

ADDITIONAL FORMULÆ.

In acute gastric catarrh in infants with nausea and vomiting.

℞ Acidi tartarici, 15 grains.
Aquæ laurocerasi, 10 to 20 minims.
Syrupi mori, 2 drams.
Aquæ destill. ad 5 oz.

M. f. mist. A dessertspoonful every two hours.
(*Prof. Monti.*)

If with fever.

℞ Acid. hydrochlorici diluti, 5 to 10 minims.
Syrupi simplicis, 2 drams.
Aquæ destill. ad 3 oz.

M. f. mist. A dessertspoonful every two hours. (*Monti.*)

When gastric irritability has disappeared, but feverishness continues.

℞ Quininæ hydrochloratis, 5 grs.
Acid. hydrochlor. dilut., 6 minims.
Syrupi simp., 1½ oz.
Aquæ destill. ad 3 oz.

M. f. mist. A teaspoonful every two hours. (*Monti.*)

For acute gastric catarrh.

℞ Acidi carbolici, ¼ grain.
Bismuthi subnitratis, 10 gr.
Mucilaginis acaciæ, 30 mins.
Aquæ menthæ piperitæ, q.s. ad 2 drams.

M. To be taken in a tablespoonful of water every one, two, or three hours. (*D. D. Stewart.*)

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* For additional details on the subject of diet see the author's work on "Food in Health and Disease," part ii. chap. ii.

Sedative mixture in acute gastric catarrh.

℞ Acidi carbolici, ¼ grain.
Bismuthi subnitratis, 10 grs.
Mucilaginis acaciæ, ½ dram.
Aquæ menthæ pip. ad 2 drms.

M. To be taken in a tablespoonful of water every two or three hours. (*Bartholow.*)

Another.

℞ Bismuthi carb., 5 drams.
Acidi hydrocyan. dil., 1 dram.
Liq. morphinæ hydr., 2 drams
Mucilag. acaciæ, 1½ oz.
Aquæ chlorof. ad 4 oz.

M. f. mist. A teaspoonful four times a day before food. (*Whitla.*)

For chronic gastric catarrh in children.

℞ Sodii bicarbonatis, 1 dram.
Creasoti puri, 4 drops.
Pulv. acaciæ, q.s.
Glycerini, 2 drams.
Ol. cinnamomi, 4 drops.
Aquæ puræ, q.s. ad 3 oz.

M. f. mist. For a child of six, a small teaspoonful in a little water, soon after meals. (*Prof. Pepper.*)

Chronic gastric catarrh with pain and vomiting in children.

℞ Quininæ sulphatis, 3 grains.
Zinci sulphatis, 1½ grains.
Sacchari albi, 45 grains.

M. et divide in pulv. 10. One to be taken before each of the principal meals. (*Monti.*)

For chronic gastric catarrh with pyrosis.

℞ Bismuthi subnitratis, 80 grs.
Morphinæ hydrochlor., ¾ gr.
Sodii bicarbonatis, 30 grains.

M. et divide in pulv. 10. A powder to be taken every two hours. (*Bamberger.*)

Do. with loss of appetite.

℞ Extracti gentianæ, 30 grs.
Syrupi aurantii corticis, 5 drams.
Aquæ destill. ad 6 oz.

M. f. mist. A tablespoonful before each meal. (*Bamberger.*)

Or

℞ Tinct. nucis vomicæ, 30 mins.
Aquæ laurocerasi, 2½ drams.
Tinct. quassiæ ad 1 oz.

M. f. mist. Fifteen drops to be taken, in water, three times a day. (*Bamberger.*)

Resorcin mixture for gastric catarrh with constipation.

℞ Resorcini puri, 30 grains.
Tincturæ rhei, 1½ dram.
Ess. menthæ pip., 1 dram.
Sodii bicarbonatis, 2 drams.
Infusi rhei ad 6 oz.

M. f. mist. One tablespoonful every two hours.

In chronic gastric catarrh.

℞ Acid. hydrochlor. dil., 2 drams.
Acid. hydrocyanici dil., 1 dram.
Strychninæ, ½ grain.
Glycerini, ½ oz.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful, in water, one hour after meals. (*Saundby.*)

In acute gastric catarrh in children.

℞ Bismuthi carbonatis, 2 gr.
Sodii bicarbonatis, 2 gr.
Pulv. rhei, ½ grain.
Pulv. aromatici, 1 grain.

M. f. pulv. To be taken before each meal.

For chronic gastric catarrh.

℞ Argenti nitratis, 6 grains.
Bismuthi subnitratis, 30 gr.
Extracti hyoscyami, 40 gr.

M. et divide in pil. 40. One morning and evening. (*Millet.*)

CHAPTER IV.

DISEASES OF THE STOMACH—TREATMENT OF ULCER OF THE STOMACH AND OF CANCER OF THE STOMACH.

ULCER OF THE STOMACH. — Characters—Causation — Obscure Symptoms and Course — Pain — Vomiting — Hæmorrhage—Indications for Treatment — Washing out the Stomach — Alimentation—Drugs, etc.—Transfusion—Treatment of Perforation—Gastrorraphy—After-treatment. CANCER OF THE STOMACH—Situation—Diagnosis—Symptoms—Indications for Treatment—Diet—Washing out the Stomach—Anti-fermentive and Antiseptic Remedies, etc.—Condurango—Operative (Surgical) Treatment—Additional Formulæ.

ULCER OF THE STOMACH.

THE disease the treatment of which we are now about to consider has been variously named "simple," "round," "perforating," and "chronic" ulcer of the stomach.

The ulcer is usually single, occasionally multiple; it varies in size from that of a sixpence to that of a crown piece; the smaller ones are circular, the larger elliptical, and those formed by the coalescence of two or more are of irregular outline. Its edges are usually clean cut, and it has the appearance of being punched out; the edges, however, become indurated and thickened in the more chronic form. As it penetrates the different coats of the stomach it does so to an unequal extent, so that it has a funnel-shaped or shelving aspect; and when it leads to *perforation* of all the coats, as it is prone to do, the peritoneal opening is smaller than the gastric. It tends to be located especially on the posterior surface, along the lesser curvature and at the pyloric end of the stomach. Its healing is attended by cicatrisation and puckering of the adjacent mucous membrane, and when this occurs extensively in connection with large or multiple ulcers extending transversely from the lesser curvature, it may cause hour-glass contraction by drawing up the greater curvature towards the lesser; or if situated near the pylorus, it may produce pyloric stenosis and consequent dilatation of the stomach.

The chief dangers attending this form of gastric ulcer are perforation and hæmorrhage. If the ulcer perforates all the coats of the stomach before inflammatory adhesion has taken place between it and one or other of the adjacent organs, fatal peritonitis is rapidly set up; if one of the larger blood-vessels becomes eroded, a large and fatal hæmorrhage may result; smaller hæmorrhages are of common occurrence, as we shall see, in the course of this disease. Owing to the greater mobility of the anterior wall and greater curvature, ulcers in these situations are attended with greater danger of fatal perforation. Relapses are frequent even after cicatrisation.

Very little is known with certainty as to the **etiology** of this affection, and very little help therefore in framing indications for treatment can be derived from etiological considerations.

It is certainly more common in women than in men, and anæmic, chlorotic, and debilitated conditions seem to predispose to its occurrence. It is said that in women the tendency to perforation is especially marked about the age of twenty. Gastric ulcer has been observed to be "most frequent in the class of maid-servants between the age of eighteen and that of twenty-five" (*Budd*), and also to be of frequent occurrence in cooks, who have to taste *hot* things, and in tipplers. The general conclusion arrived at is that some local affection of the vessels of the mucous membrane at the seat of ulceration is attended by thrombosis and obliteration of the vessels of a small vascular area, with consequent necrosis of the corresponding mucous surface—that this is attacked and dissolved by the gastric juice, and perhaps a condition of *hyperacidity* of this secretion may determine the solution of the subjacent tissues and the rapid formation or deepening of the ulcer. However, as already stated, the etiology of simple gastric ulcer is admittedly obscure.

The **symptoms** of this affection must next be examined in detail. The three most important are—(*a*) pain; (*b*) vomiting; (*c*) hæmorrhage.

(*a*) The *pain* of gastric ulcer usually comes on directly after taking food, but it may be delayed for half an hour or longer. It is commonly localised in a circumscribed spot in the epigastrium. Paroxysms of more diffused pain are also common, spreading over the whole epigastric region and extending through to the lower dorsal or interscapular region. Coarse, indigestible, hot, and pungent foods are especially prone to excite this pain. It usually continues as long as food remains in the stomach, and is relieved when the contents of the stomach are discharged by vomiting. The pain is generally increased by pressure, and there is almost always some tenderness on pressure over a circumscribed spot in the epigastrium even when the stomach is empty. When the tenderness on pressure is exceedingly severe, it is regarded as a sign of the occurrence of peritonitis around the seat of the ulcer. The pain of gastric ulcer is sometimes radiated to more distant nerves—the lower intercostal, other branches of the vagus, etc.—and pains may arise from cicatricial adhesions to other organs and the involvement of nerve fibres in these cicatrices, and it must be borne in mind that *such pains may continue after the healing of the ulcer.*

The pain following the taking of food is regarded as caused by the movements then excited in the stomach irritating the surface of the ulcer, and this is further aggravated by contact with the acid gastric juice secreted on the introduction of food. There is often a complaint of more or less continuous dull aching pain in the epigastric region in the intervals of digestion. It is important to bear in mind that in some latent and obscure cases severe pain is wholly absent, and fatal perforation or severe hæmorrhage may occur suddenly and unexpectedly, the only preceding symptom being a little uneasiness during digestion.

(*b*) *Vomiting* is rarely absent in cases of gastric ulcer. It usually occurs, as the pain does, shortly after taking food; it is ordinarily preceded and accompanied by pain, which the vomiting, when complete, relieves. The vomited matters consist of food more or less changed, mixed with mucus and acid secretions in which sarcinæ may often be found. The vomiting is provoked by irritation of the nerve-fibres in the ulcerated surface and by the frequent co-existence of gastric catarrh, and it is especially excited by improper and irritating food. Its effect is to exhaust the patient by the continuous withdrawal of nourishment, unless it be checked by treatment.

(*c*) *Hæmorrhage.*—Probably in all cases of gastric ulcer some bleeding takes place into the stomach from the surface of the ulcer, but a small hæmorrhage need not lead to vomiting; it would, however, probably reveal itself in the altered colour of the stools if these were watched. But when there is frequent vomiting in cases of gastric ulcer, the vomited matters usually at some time or other contain blood. The vomit is often of a dirty brown colour, due to the action of the gastric juice on the hæmoglobin. It has been estimated that a considerable hæmorrhage occurs in about one-third of the cases; some authorities (*Lebert*) consider that it occurs in a far greater proportion. It is absent, as a rule, in the acute perforating cases.

The hæmorrhage may vary considerably in amount, from a little oozing just sufficient to discolour the vomit to large gushes of blood seriously imperilling the life of the patient, and sometimes sufficient to at once cause fatal syncope. The occurrence of profuse hæmorrhage shows that the ulceration has extended deep enough to reach and erode the larger vessels. In such cases the blood vomited is often pure and of a bright colour, not having remained long enough in the stomach to be altered by contact with the gastric juice. All the blood that thus escapes is not, of course, vomited, but much passes away through the intestinal canal, giving rise to what are termed "tarry" stools; and in rapidly fatal cases there may be no escape of blood by the mouth, as it may immediately over-distend the stomach and remain there. The non-fatal hæmorrhages tend to recur frequently, as the movements of the stomach—and especially those induced by the ingestion of food—lead to the re-opening of the bleeding vessels. These repeated losses of blood either induce a profound anæmia or lead ultimately to death by exhaustion.

In addition to these three prominent symptoms, most sufferers from gastric ulcer present the more common symptoms of the dyspeptic state, as a condition of chronic gastric catarrh often accompanies ulceration of the stomach. Cases, however, occur in which no symptoms of dyspepsia are complained of. Usually, however, there are loss of appetite, heartburn, and acid* eructations, nausea, a sense of weight and oppression in the epigastrium, thirst, bad taste in the mouth, and the usual symptoms of chronic gastric catarrh. In advanced cases, owing to impairment of the movements of the stomach by adhesion to other organs, or by contraction of parts owing to extensive cicatrisations, dilatation of the stomach may be developed with retention and decomposition of food.

Constipation is a usual accompaniment of gastric ulcer; this is chiefly due to the small amount of food digested, the greater part being rejected by vomiting.

A condition of general debility with great depression of spirits is usually induced by chronic ulcer of the stomach, but we meet with exceptional cases in young women who remain fairly plump and well-nourished.

Amenorrhœa is a common accompaniment of this disease.

It has been calculated that perforation into the general peritoneal cavity occurs in about 6·5 per cent.

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* Ewald, Reigel, and others state that the gastric juice withdrawn from the stomach in cases of simple ulcer is, almost always, more *acid* than in health.

of all cases of ulcer of the stomach;* it occurs twice or three times more frequently in the female than the male, and in the former especially between the ages of fourteen and thirty. It is important to bear in mind from the point of view of treatment that the immediate cause of perforation of gastric ulcer is often the existence of some condition producing tension of the stomach walls, such as distension with food or gas, retching, and vomiting, straining at stool, coughing, sneezing, violent exertion or sudden movement of the body, and mechanical pressure on the epigastrium. Perforation of a gastric ulcer is reported to have occurred from kneading the abdomen to relieve flatulence in a patient in a hydropathic establishment.†

Gastric ulcer in the majority of cases is completely curable; it must, however, be remembered that cicatrisation of an extensive ulcerated surface of the gastric mucous membrane and subsequent contraction of this cicatrix, or adhesions between the stomach and surrounding organs may lead to troublesome symptoms later on, such as gastralgia, vomiting, and other symptoms of dyspepsia, or contraction of the pyloric end of the stomach may cause dilatation and its consequences, as has already been pointed out.

The *great* and *paramount indication* in the **treatment** of gastric ulcer is to promote healing and cicatrisation of the ulcerated surface. This will be best effected by such means as will remove all sources of irritation and secure the greatest amount of **rest,** mechanical and functional, to the gastric mucous membrane; the avoidance of irritating movements being an important condition of the healing process. The stomach must, therefore, be kept as empty as possible, since the presence of food excites movements in it. By keeping the stomach empty we also avoid the irritating contact of food and gastric juice with the ulcerated surface; and the gastric mucous membrane being thrown into folds, in the contracted state of the stomach, the extent of the ulcerated surface is thereby diminished and its healing promoted.

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* Prof. W. H. Welch, "Pepper's System of Practical Medicine," vol. ii. p. 497.

† Dalton, *Transactions* of the New York Pathological Society, vol. i. p. 263.

An *appropriate method of feeding* is, then, the most important part of the treatment of such cases. Medicinal remedies may also be of value: (*a*) by producing a protective covering to the ulcerated surface, and so preventing the contact of irritating substances with it; (*b*) by *arresting hæmorrhage;* and (*c*) by *relieving pain.*

As to the practice of *washing out the stomach,* which has been advocated by some physicians, in this disease, we agree with Sée, Leube, and Ewald that it is not unattended with danger of severe and fatal hæmorrhage, and that it is not to be commended. It is also inconsistent with the idea of keeping the stomach at rest. In certain very chronic cases, accompanied with chronic catarrh and dilatation of the stomach, and the protracted retention and decomposition of food in that organ, cautious and careful washing out, using a soft rubber tube and adopting the syphon process,* may, however, be useful. But when there is any risk of exciting hæmorrhage, this method must be strictly avoided.

Dujardin-Beaumetz has, perhaps, said all that can be said in favour of this method.† First, he says "lavage (washing-out) may be usefully employed at the commencement of this affection, before any hæmorrhage has occurred, and when there is only severe pain accompanied by vomiting, especially if we use *milk of bismuth* for the purpose."

In opposition to this opinion we would point out that it is precisely in these early cases that other medicinal and dietetic treatment, such as we shall immediately point out, is so completely and quickly efficacious.

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* As described in the chapter on Dilatation of the Stomach. Whitla states ("Dictionary of Treatment") that he has had eighty satisfactory results from washing out the stomach in cases of *chronic irritable* ulcer.

† "Clinique Thérapeutique," 5th edition, p. 588.

In the next place he remarks, "It is especially at the terminal period of the case, when cicatrisation is in progress and hæmorrhage has ceased, that *lavage* may be of great service. By cleaning the mucous membrane and the surface of the ulcer we prevent the lingering contact of particles of food which by their presence impede cicatrisation and irritate the surface of the ulcer; and, just as we see ulcerated sores on the surface often heal under the influence of repeated dressings and washings, so also in the same way ulcerations of the gastric mucous membrane are favourably modified by the same means."

To this argument it may also be replied that by a longer continuance of careful dieting and appropriate medication the same ends may be obtained, while we avoid the dangers attending mechanical distension of the stomach and possible mechanical injury to the ulcerated surface. He is himself mindful of these risks, especially if *lavage* be practised soon after an attack of hæmatemesis—"fresh vomiting of blood may be provoked, either by detaching too quickly the fibrinous plugs from the bleeding vessels, or by provoking renewed contraction of the stomach."

In the next place we will consider the mode of alimentation best calculated to promote mechanical and functional **rest** of the stomach, and so contribute to the speedy healing of the ulcerated mucous membrane. We have elsewhere formulated rules for this purpose[*] which may be thus summarised.

In cases of perforating ulcer, when severe and dangerous hæmorrhages have occurred and may recur, it is necessary to keep the stomach absolutely at rest and empty. For three or four days at least the patient should be fed exclusively with nutrient enemata.[†]

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[*] "Food in Health and Disease," p. 377.

[†] Ewald maintains, in opposition to the generally accepted opinion, that peptonisation is not necessary to insure the absorption of nutrient enemata. His formula is to beat up 2 or 3 eggs with a tablespoonful of cold water; to boil as much of the very

To allay thirst a few fragments of ice may be sucked, or a tablespoonful of iced water be given every half hour. At the same time, complete rest in bed must be enforced.

After four or five days of this treatment, some *fluid* food, in small quantities at a time (not more than 2 ounces), may be given every three or four hours. When any immediate risk of further hæmorrhage appears no longer to exist, in these, and in other less serious chronic cases, feeding by the stomach may be carried out on the following principles:—(*a*) All food that can either mechanically or chemically irritate the surface of the ulcer must be avoided. (*b*) Food that is calculated to stimulate the acid secretions of the stomach must be forbidden, as these act as irritants to the ulcerated surface; therefore predigested foods, or foods that will pass through the stomach and be digested in the small intestine, are indicated. (*c*) We must be especially careful to avoid *distending* the stomach by giving any great quantity of food at a time, for, as we have already said, by maintaining the stomach in a contracted condition its mucous membrane is thrown into folds, the margins of the ulcer are relaxed and its superficial extent thereby diminished—circumstances which favour the filling up and cicatrisation of the ulcer. The quantity of fluid or semi-fluid food should therefore be limited to between 2 to 4 ounces at a time. As a rule, restriction to an exclusively milk diet will fulfil these indications. It is essential, however, that we should obviate the possible danger of the formation of a considerable mass of milk curd in the stomach by taking measures to

best flour as will go on the point of a knife with a 20 per cent. solution of grape sugar, and add a wineglassful of red wine; then to stir the egg slowly into this mixture when it has cooled. Dreschfeld uses 2 raw eggs beaten up with 2 oz. of beef-tea and occasionally an oz. of brandy. Jaccoud uses the yolks of two eggs, 8 oz. of *bouillon*, 3 oz. of wine, and 1 to 4 drams of dry pepsine. The following is a useful form and is easily prepared: Beat up two eggs with 3 or 4 oz. of warm milk, add a dessert-spoonful of liquor pancreaticus and 20 grains of sodium bicarbonate. A tablespoonful of brandy may be added.

prevent any firm coagulation of the casein of milk in that organ. The milk should in all cases be *diluted* with an alkaline water, and pure undiluted milk should never be given except in convalescent cases and in persons who have been found to digest milk with facility. The milk may be diluted with an equal quantity of lime water or Vichy water, or to each cup of milk and water a powder may be added composed of

Bicarbonate of soda	15 grains.
Light magnesia	5 ,,

Four ounces of milk and water thus treated may be given every two or three hours. If we desire to give the patient more concentrated or more supporting food, an egg may be beaten up with two tablespoonfuls of boiling water, and then strained through muslin, and to this 2 ounces of milk and water may be added; or about 1 ounce of the crumb of a stale roll, well soaked previously in hot water and rubbed through a sieve, may be mixed with three ounces of milk and water, and given twice or three times a day.

In cases where we encounter a distinct intolerance of a milk diet, small quantities of meat or chicken may be given, finely divided or reduced to a pulp (the lean only), mixed with a little weak broth or *consommé*.*

Leube's soluble meat is much used in Germany in cases like these. This preparation is usually mixed with slightly salted broth and taken lukewarm; some milk and some well-soaked bread may be added.

All wine and spirits should be forbidden. A little weak tea with milk may be permitted, but not more than three-fourths of a small teacupful at a time. If oatmeal gruel is given (and it may be advantageously mixed with milk) it should be prepared with finely-powdered oatmeal, and not with coarse groats, the rough particles of which are apt, by their contact, to set up irritation of the ulcerated surface. Peptonised foods, especially milk and gruel, may also be used.

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* The lean of meat (raw) passed once or twice through an American mincer, and then cooked for twelve minutes in a *bain marie* with a little water, will be found a useful food in these and many other circumstances.

Debove has suggested in these cases, as well as in some cases of acute gastritis, in order to completely suppress the stomach functions, that powdered meat should be mixed with water strongly alkalinised by sodium bicarbonate, so as to completely saturate such gastric juice as may be secreted. The meat would then pass on into the small intestine and be digested there.

Rest in bed is a most important condition in the graver cases, as it not only avoids movement of the injured organ, but it lessens the nutritive wants of the system as much as possible. In less serious cases, although a certain limited amount of gentle exercise may be permitted, the advisability of physical rest must still be kept in mind.

When there is reason to believe that cicatrisation has been established, a cautious and gradual return to ordinary diet may be permitted, care being observed that the food is of a kind easy of digestion.

In chronic cases, associated with much chronic catarrh of the stomach, the advantage of clearing out and cleansing the stomach and alimentary canal by repeated draughts of Carlsbad water or a solution of Carlsbad salts* in hot water has been urged by many authorities. The sodium sulphate in these salts, by stimulating peristaltic action, promotes the expulsion of the contents of the stomach into the small intestine; the sodium carbonate dissolves stringy and tenacious mucus and also aids in its detachment and expulsion from the stomach, while it acts also usefully as an antacid; the sodium chloride is a stimulant to digestion and an antiseptic. The object in view is the same as that aimed at by *lavage*, viz.

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* Artificial Carlsbad salts are best made by combining sodium sulphate, sodium carbonate, and sodium chloride, in the proportion of 8 oz. of the first, an ounce of the second, and ½ oz. of the third.

the regular removal of the decomposing and irritating stomach contents from contact with the ulcerated mucous membrane.

The following is the best way of carrying out this treatment:—A teaspoonful of the Carlsbad salts is dissolved in 6 oz. of warm water (about 100° to 120° F.), and four such doses are taken, at intervals of ten or fifteen minutes, in the morning, fasting. Breakfast must not be taken until half an hour after the last dose. After breakfast the patient usually has two or three loose actions of the bowels. If the bowels are too freely acted upon, a somewhat smaller quantity of the salts should be added to each glass of water; and if not sufficiently relieved, the quantity of the salts, but not of the water, must be augmented.

In the next place, we will consider the value of certain medicines which have been employed—(*a*) for their local cicatrising action on the ulcer itself; (*b*) for the relief of pain and vomiting; and (*c*) for the arrest of hæmorrhage.

It has been maintained, and we think justly, that the administration of **alkaline carbonates,** by neutralising the hyperacidity and so lessening the irritation of the gastric secretions, assists in promoting healing of the ulcerated surface, and that they promote the passage of the food into, and its digestion in, the small intestine. The objections put forth by some physicians, on physiological grounds, that the administration of alkalies provokes the secretion of *acid* gastric juice, is really not applicable to these *morbid* states in which the gastric secretions are already excessively acid from undue retention and fermentation. To urge such objections betrays a want of discrimination and of *practical* experience. Physiological observations are applicable to normal physiological conditions, and before they are applied to morbid, pathological states, they must be corrected by practical clinical experience; and the latter affords abundance of evidence of the value of alkalies administered at suitable times in such cases.

Niemeyer, who was an admirable clinical observer, says, "The therapeutic use of the alkaline carbonates has a wonderful effect in chronic ulcer of the stomach." *

A combination of sodium bicarbonate, magnesium carbonate, and bismuth carbonate or sub-nitrate, is one of the most efficacious prescriptions (together with a milk diet) in the treatment of *average* cases of chronic gastric ulcer as we meet with them in hospital practice. The magnesium carbonate being an insoluble substance except in the presence of an acid, will continue to neutralise or diminish the gastric acidity so long as any of it remains undissolved. And we think there can be little doubt that when the stomach is empty and contracted, and the patient lying recumbent in bed, the mixture of bismuth and magnesia must form more or less of a protective covering to the ulcer, and so favour the healing process. The following is a suitable formula for these cases:—

℞ Bismuthi carbonatis	āā 10 grains.
Magnesii carbonatis	
Sodii carbonatis	5 ,,
Mucilaginis tragac.	1 dram.
Aquæ	ad 1 oz.

M. f. haust. To be taken a few minutes before the giving of food, three or four times a day.

Some French physicians give much larger doses of bismuth, as much as 2 to 3 drams, and Ewald approves of this, and thinks it "most sensible," but too expensive for poor patients, and suggests the use of carbonate of lime instead.

In more troublesome chronic cases we have found **nitrate of silver** of considerable value. We believe that suitably administered it forms a protective covering to the ulcerated surface and promotes healing, but much, no doubt, depends on the situation of the ulcer; it is quite conceivable that an ulcer on the posterior wall of the stomach would be much more amenable to such action than one on the anterior surface, and it would be necessary also that the stomach should be as nearly as possible empty at the time of its administration. Gerhardt thinks the nitrate of silver acts beneficially by preventing the secretion of too much acid gastric juice, and so lessens pain.[*] The following pill may be given three or four times a day about half an hour before giving food :—

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* "Text-book of Practical Medicine," vol. i. p. 513.

Argenti nitratis	⅓ grain.
Ung. kaolin	q.s.

Ut f. pil.

The antiseptic action of both bismuth and nitrate of silver may have something to do with their beneficial effects in these cases.

Some physicians[†] have advocated the use of the tincture of perchloride of iron as a remedy which promotes a healthy, healing action in the ulcerated surface and allays pain. It certainly seems likely to be useful in certain low cachectic or anæmic cases. It may be given in 5-minim doses in two tablespoonfuls of water several times a day. In cases where aperients cannot be given it is desirable to wash out the bowel daily with a copious enema of tepid water.

Of the various remedies used for the relief of pain and vomiting, in addition to those incidentally mentioned, we have opium, chloroform water, hydrocyanic acid, cocaine, creasote, ice, applied externally and internally, hot fomentation, and counter-irritation.

Few cases of chronic ulcer of the stomach can be satisfactorily treated without the occasional use of **opium,** especially for the purpose of calming those severe attacks of pain and vomiting which commonly occur during the course of the disease. Brinton maintained that over and above its influence in relieving pain, opium was *essential* to the cure of gastric ulcer; we are unable to share this view, as we have repeatedly seen rapid recoveries from gastric ulcer without the administration of a single dose of opium.

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[*] *Deutsche Med. Wochen.*, 1888, No. 18.

[†] Gerhardt and Luton.

A pill of the extract of opium ($\frac{1}{2}$ grain or a grain) may be given two or three times in the twenty-four hours until the pain is relieved; or 5 to 15 minims of the liquor opii sedativus, according to the severity of the pain, may be added to each dose of the bismuth and magnesia mixture; or it may be given combined with a tablespoonful of lime water; or if there is great irritability and intolerance on the part of the stomach, a hypodermic injection of $\frac{1}{4}$ or $\frac{1}{3}$ of a grain of hydrochlorate of morphine may be given; or small doses of morphine ($\frac{1}{12}$ to $\frac{1}{6}$ grain), combined with dilute hydrocyanic acid 3 to 5 minims, in a tablespoonful of water, may be given by the mouth every three or four hours with good effect.

As an alternative to the employment of opiates when any objection exists to their use, cocaine may be given. It produces anæsthesia of the gastric mucous membrane, and so allays pain and lessens the sensation of hunger. A tablespoonful of the following may be given from time to time:—

℞ Cocainæ hydrochloratis	3 grains.
Aquæ laurocerasi	6 drams.
Aquæ .. .. ad	3 oz.

M. f. mist.

Creasote shaken up with water in the proportion of 1 minim to 2 ounces, and given in doses of one tablespoonful every two or three hours, has been found to relieve both pain and vomiting in some troublesome chronic cases; its antiseptic and antifermentive action may here be of value.

The internal and external use of ice has been found of service in allaying gastric irritability and relieving pain. Leeches to the epigastrium, hot poultices and blisters, have their respective advocates. In obstinate cases of fixed pain referred to the epigastric region, a small blister applied to the painful spot may be of benefit, and the raw surface may be dressed with morphine.

In hæmorrhagic cases the strict dietetic method already outlined must be rigidly applied, and all food must be given by the bowel. Small fragments of ice should be sucked or swallowed, a bladder of ice applied to the epigastrium, and mustard plasters to the feet as derivatives. The hypodermic injection of ergotine, perchloride of iron in 20-minim doses with an ounce of iced water, and such other measures, may be employed, as are referred to in the chapter on *hæmatemesis*. The most complete physical rest must, of course, be enforced.

Dujardin-Beaumetz recommends *transfusion** in cases of alarming hæmorrhage from gastric ulcer. He believes that it not only supports the strength of the patient and the cardiac action, but that it acts as a hæmostatic. He mentions a case in which, in consequence of repeated profuse hæmorrhages, the patient was reduced to the last extremity—pale, cold, pulse imperceptible; in this case, by the aid of Dr. Roussel, and with his apparatus, 150 grammes (about 5 ounces) of blood were transfused, with the effect of reviving the patient and permanently arresting the bleeding. Larger quantities than this must not be employed for fear of producing distension of the arterial system, thus re-exciting hæmorrhage.

Although **perforation** of the stomach is usually and speedily fatal, recoveries have occasionally occurred, because probably the stomach was empty at the time of the occurrence, and it is necessary therefore to consider what are the best means of dealing with that accident. The patient should be brought quickly under the influence of opium—preferably by hypodermic injections of morphine or by opiate enemata, as it is undesirable to allow anything to pass by the mouth into the stomach. Twenty drops of tincture of opium in 2 ounces of thin starch mucilage may be injected every hour into the rectum, or $\frac{1}{3}$ grain of hydrochlorate of morphine may be given hypodermically every hour for three or four doses.

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* "Leçons de Clinique Thérapeutique." Traitement de l'ulcère de l'estomac. Fifth edition. Vol. i. p. 592.

Ice-cold compresses to the abdominal surface are useful in allaying peritonitis; some, however, prefer warm fomentations, to which some tincture of opium may be added. The free use of opium will, at any rate, relieve the sufferings of the patient if it does nothing more.

In order to prevent the further escape of the stomach contents through the perforation, Schliep has resorted to the cautious use of the stomach tube with success.

Mr. Barton has recently recorded a case of recovery after perforation of gastric ulcer with formation of abscess which burst into the bowel. Opium was given largely by the bowel, as well as stimulants, and only small quantities of ice by the mouth to relieve the intense thirst.*

The operation of *gastrorraphy* has been performed, once at least, with success, for perforating ulcer of the stomach. Greig Smith considers the operation justifiable when it offers the only means of saving the patient from certain death. He says, "when with a clear history of ulcer of the stomach, undeniable symptoms of perforation suddenly come on, abdominal section, cleansing of the cavity, and closing of the stomach opening by suture, give the patient the only chance of life. A very slight chance of success would justify operation." †

The **after-treatment** of cases of cured gastric ulcer must be conducted on general principles. The anæmia must be treated with mild preparations of iron, the dyspepsia by careful and cautious feeding; the frequent co-existence of constipation should be treated by enemata of salt and water (a teaspoonful to a pint of water), or by a dose of Carlsbad salts in the morning fasting in the manner already indicated. Leube recommends a course of the Franzensbad or Elster waters on account of the iron they contain, in addition to the aperient sulphates, and Gerhardt and

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* Clinical Society's *Transactions*, vol. xxiii.

† "Abdominal Surgery."

Bamberger strongly recommend the course at Carlsbad in recent cases.

If persistent cardialgia and dyspepsia are found to follow the cicatrisation of gastric ulcer, it is probable either that the cicatrisation has led to the compression of some filaments of the gastric nerves, or that adhesions to adjacent organs have formed, producing painful dragging or tension during the movements of the stomach in the processes of digestion. Extensive cicatrisation near the pyloric end of the stomach may lead to stricture and subsequent dilatation of the stomach, the appropriate treatment of which conditions will be considered hereafter.

Finally, when we are in doubt whether a case is one of gastric ulcer or not, it is best, especially if we have to do with a young or chlorotic girl, to treat the case as if it were one of ulceration, for it is precisely in this class of patient that perforating ulcer of the stomach is apt to run a latent course and to suddenly end in perforation or be attended with sudden and profuse hæmatemesis; and even if the case should not be one of ulceration, but simply one of functional disease, the strict dietetic treatment appropriate to the former condition cannot do harm in the latter, but rather good—indeed, it may serve as a prophylactic measure, especially if followed by suitable tonic treatment.

CANCER OF THE STOMACH.

Cancer of the **stomach** is universally regarded as an incurable disease, and its treatment is mainly symptomatic and palliative, apart from those surgical procedures which have in recent years been applied to certain forms of this affection, the details and results of which we propose hereafter to examine.

Although cancer of the stomach is an incurable malady, we have had reason to believe that the rapidity of its course, in some of its forms, may be considerably modified by appropriate treatment, and the comfort and strength of the patient maintained even for many years.

As the **causes** of cancer, and the conditions that give rise to its development, are, at present, unknown, no causal indications for treatment can be formulated. The attainment of a certain age seems to be one of the conditions of its occurrence, cancer of the stomach being especially a disease of middle and advanced life. It is rarely encountered in persons under thirty years of age, it is most common between forty and sixty, but a goodly number of cases occur between thirty and forty, and after sixty.

The seat of cancer of the stomach is, in the great majority, viz. in four-fifths of the cases, limited to that comparatively small portion of the stomach containing its two orifices—the cardia and the pylorus—and the intermediate lesser curvature. The fundus is very rarely affected, in not more than 1½ per cent. of all the cases. The pylorus, or its immediate neighbourhood, is the part most frequently attacked ; three-fifths of the cases of gastric cancer are seated at the pylorus, and it is in this proportion of all cases of cancer that the morbid conditions we have to treat are those resulting from pyloric obstruction.

Cancer, located at the cardiac or pyloric orifices, naturally gives rise to mechanical difficulties either in the entrance of food into the stomach or in its escape from it, and to the symptoms and morbid manifestation dependent thereon. Cancer not involving either of these situations, and not interfering with the entrance or exit of the food, may long exist without giving rise to any characteristic symptoms, and may even remain undetected throughout its whole course.

The **symptoms** of cancer of the stomach are not always clearly diagnostic, inasmuch as many of them are common also to cases of chronic gastric catarrh with dilatation from other causes, and to cases of chronic ulcer. The loss of appetite, the pain after taking food, the flatulence and dyspepsia, the vomiting, the sour eructations, the progressive emaciation, the occurrence of hæmatemesis, the constipation, the presence of blood in the stools, the tenderness in the epigastric region, and the signs of dilatation of the stomach may all exist without the existence of cancer; and it is on this account that it has been thought impossible to diagnose, with accuracy, the presence of cancer of the stomach, unless there are clear signs of a *tumour* in the epigastrium.

There are, however, certain appearances which, taken collectively, point strongly to the existence of cancer, although neither of them alone may be absolutely diagnostic. One of those is the peculiar colour of the complexion, which is associated with the progressive emaciation—that aspect which has been termed "earthy," or "waxy," or "fawn-yellow," or "dirty-yellow, cachectic colour," none of the terms expressing very well the peculiar type of complexion which so commonly accompanies malignant visceral disease, but which is readily recognised by the experienced eye.

The *loss of appetite* is usually much more complete and persistent in cancer than in chronic ulcer or chronic catarrh.

The *pain* of cancer is often almost continuous, and not merely excited by the presence of food, as in simple ulcer, and when it is dependent on the presence of food it usually appears not immediately after taking food, as in ulcer, but when digestion is more advanced; this is especially the case in pyloric cancer.

The *vomiting* usually occurs a longer timo after taking food than in gastric ulcer, and in cases of cancerous obstruction of the pylorus it may not take place until some hours after the reception of food, and may be extremely *copious* from the co-existence of great dilatation of the stomach. When the cardiac orifice is the seat of cancer there is usually some dysphagia and the food is regurgitated rather than vomited almost immediately after it is taken, unchanged, or simply mixed with mucus. Whenever we find this persistent regurgitation of food, with signs of atrophy of the stomach, such as sinking in of the epigastrium, and a difficulty or inability to pass the œsophageal bougie, together with the presence of a cachectic aspect, the existence of cancer of the cardiac orifice of the stomach is pretty certain.

"Coffee-grounds" vomit, or vomited matters coloured blackish-brown, from the presence of blood oozing from the ulcerated surface of the cancerous mass, and altered by contact with acid gastric secretions, is observed in many cases of somewhat advanced gastric cancer. Copious hæmorrhage is far more common in chronic ulcer than in cancer. The presence of blood in the stools (mælena) is often observed in gastric cancer, when there may be no blood in the matters vomited, or when vomiting is absent.

Occasionally cancerous particles may be found in the vomited matters; we have recorded such a case in which the diagnosis was otherwise doubtful.*

The *emaciation* and *anœmia* in cancer are usually more marked, more uninterrupted, and progressive and more distinctly cachectic than in chronic ulcer or chronic gastric catarrh.

Von der Velden and others have stated that the absence of free hydrochloric acid in the gastric juice is characteristic of dilatation of the stomach due to cancer, and that this gastric juice has a very feeble digestive power for albuminous substances. Although the absence of free hydrochloric acid in the gastric juice may be discovered in other diseases besides cancer, there seems to be little doubt that its invariable *presence* is strong evidence against the existence of cancer, and certainly an important therapeutic indication may be derived from this observation.†

Constipation, which is usually very obstinate, and is probably due to the small amount of food digested and passing out of the stomach, is a symptom which has to be considered in the treatment of these cases. The occasional occurrence of diarrhœa is not, however, uncommon. This may be due to the irritation of undigested food, or to the existence of intestinal catarrh.

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* *Lancet*, January 29, 1876.

† Ewald says: "In the large majority of cases of carcinoma of the stomach there is no free hydrochloric acid. This is, however, not caused by the mystic influence of the carcinoma on the production of hydrochloric acid, but simply by the accompanying catarrhal inflammation or atrophic condition of the mucous membrane of the stomach. Should these conditions be absent, then there will be a copious secretion of hydrochloric acid." ("Diseases of Stomach," vol. ii. p. 397.)

The careful analysis of each case as it comes before us, especially with reference to the symptoms enumerated, will usually enable us to arrive at a correct diagnosis ; but the confirmation afforded by the presence of a painful tumour in the situation of the cardiac or pyloric orifice would be required before operative surgical procedures would be justified.

After these preliminary considerations we may now proceed to consider the indications for **treatment** in cases of gastric cancer. The first of these is a *suitable regulation of diet.* In arranging the diet of a patient with cancer of the stomach we must endeavour to supply as much nutriment as will adequately meet the demands of the body so as to check the progressive emaciation, and at the same time reduce to a minimum the work of gastric digestion, and the pain and distress connected with it. The food we give should either be easily absorbable by the vessels of the stomach itself, and cause little or no irritation by its presence there, or it should pass readily out of the stomach and be absorbed lower down in the alimentary canal. We must not, however, under-estimate the digestive capacity of the stomach itself in all patients with gastric carcinoma, for in some it is very considerable, especially in cases of slowly progressing scirrhus pylorus, where the greater part of the gastric mucous membrane retains its functional activity. We have known such cases in which a fair amount of solid animal food was taken and digested, for many years, with only occasional attacks of severe dyspepsia. An important point to keep in view in the feeding of cases of cancerous stricture of the pylorus is to give such food as can be digested and absorbed *in the stomach*—or predigested fluid food—so that it may not have to pass in any quantity through the narrow pyloric outlet (or set up any irritation there), in order to be digested lower down. The starchy, farinaceous foods, so often prescribed in these cases, should therefore be avoided unless predigested, for they cannot be digested in the stomach, and we know there exists an obstruction to their passing out of that organ, and the result is that they are retained there, where they give rise to the development of lactic and butyric acids, and consequently to the occurrence of much pain with troublesome nausea and vomiting. When farinaceous foods are found to give rise to pain, gastric distension, and vomiting, they should be suppressed and the diet restricted absolutely to concentrated meat *solutions and foods that can be absorbed in the stomach;* or, on account of their perfect fluidity, pass easily into the small intestine. If the cancerous growth does not involve the pylorus there is not the same objection to the carbo-hydrates, because there is not then the same risk of their retention and acid decomposition in the stomach. In cancer of the stomach the food generally speaking should be fluid and concentrated, so as to be of small bulk. Milk, when well borne, is excellent. It is desirable to dilute it slightly with some alkaline water. When ordinary fresh milk disagrees, peptonised milk may be substituted for it.

In hæmorrhagic cases it may be necessary for a time to feed the patient entirely by means of nutrient enemata so as to keep the stomach absolutely at rest; and indeed, in non-hæmorrhagic cases, it is a good expedient from time to time to feed the patient for a few days *per rectum*, so as to give the stomach periods of entire rest. Some prefer small enemata of 3 or 4 drams of beef peptones mixed with 2 or 3 ounces of warm water. Dr. Greig Smith prefers a larger quantity, as he rightly says a certain amount of water is essential to nutrition, and he prescribes an egg beaten up with 10 ounces of milk and 2 or 3 tablespoonfuls of peptonised meat jelly, with or without brandy, to be passed into the bowel very slowly every five or six hours, when it will be retained without difficulty. Peptonised milk may also be used. The injection once or twice daily of a pint of tepid water into the large intestine as advised by Dr. Greig Smith we think a wise expedient.

Professor Bauer corroborates our own view of the desirability in carcinoma of the stomach of giving "animal, highly-albuminous foods, as milk, eggs, and tender meat, and meat juices, in preference to those which, from the large amount of hydro-carbon they contain, are easily prone to abnormal and acid fermentation."

In these cases a certain amount of choice may be afforded the patient, who has often learnt by observation the particular kind of diet that suits him best. But it should always be in *small quantity* at a time; on this point few patients can be left with safety to their own inclinations.

In a few cases a dry diet has been found to agree better than a fluid one. Much, no doubt, depends on the seat of the disease and the secondary changes, such as dilatation, etc., to which it has given rise, so that each individual case must be studied carefully as to the facility with which different articles of food can be digested. In cancer of the *cardiac* orifice we are restricted to fluid food, as solid food would be arrested and would accumulate in the œsophagus and cause dilatation. If the stricture of the cardiac orifice is considerable it may be advisable to introduce a stomach tube through the stricture and in this way introduce food into that organ; or nutrient enemata of peptonised foods may be given, such as the *pancreas and meat* enemata, already referred to.

Besides appropriate dieting, the treatment of cases of gastric carcinoma involves the utilisation of such means as are at our disposal—(*a*) for the arrest of the abnormal decomposition and fermentation of the food retained in the stomach; (*b*) for the relief of pain, acidity, and vomiting; (*c*) for the arrest of hæmorrhage; (*d*) for the regulation of the bowels. Finally, in certain cases of strictly localised obstruction the adoption of surgical measures to remove the diseased part may be feasible.

When the cancer is situated at the pylorus, and there is considerable dilatation of the stomach, very good results have been obtained by washing out the stomach by means of the siphon tube,* or stomach pump, as recommended by Kussmaal. The mucous membrane is cleansed by this process, and the acid, irritating matters resulting from the prolonged retention of food in the stomach are removed. The feelings of distension and heartburn are relieved and the tendency to hæmorrhage diminished. Constipation is also frequently removed by this process, probably by improving the general tone and facilitating the passage of food along the intestinal canal. It is unsuitable in cases of great debility or when hæmorrhage is actually taking place.

Charcoal in 10- to 20-grain doses, three or four times a day, often proves of value in relieving the flatulence and acidity suffered from in these cases; or equal parts of charcoal, subnitrate of bismuth, and carbonate of magnesia, make a valuable powder for relieving flatulence and acidity. Ewald, however, condemns the use of charcoal as "irrational."

We have found the greatest benefit from the use of *creasote* or *thymol*, together with a suitable diet, in cases of cancer of the pylorus, the tendency to flatulent decomposition of food in the stomach being often completely averted. A minim of creasote in a capsule may be given thrice daily immediately after taking food, or a grain of thymol, made into a pill with powdered soap and a little spirit, may be used instead, especially when the patient objects to the odour of creasote. We have often seen such excellent results in cases of scirrhus pylorus from the persevering use of creasote that we have been led to think it must exercise a retarding effect on the growth of the cancer. *Resorcin* is preferred by some.

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* *Vide* chapter on Dilatation of Stomach.

The risks of morbid fermentation will also be diminished and digestion promoted by giving a few grains of pepsin, with 10 to 20 minims of dilute hydrochloric acid, with as well as after each meal containing albuminous food. This will supply the defect of hydrochloric acid and of digestive activity in the gastric juice of such patients, and enable them to digest small quantities of pounded meat, eggs, fish, etc.

We find that Dujardin-Beaumetz,* in a recent communication on the treatment of gastric cancer, is entirely in accord with us as to the importance of maintaining complete antisepsis of the stomach. He prefers for this purpose salicylate of bismuth, naphthol, or salol—given in a wafer (cachet) before each meal. He uses one of three prescriptions—the first consists of a powder containing 5 grains each of salicylate of bismuth, bicarbonate of soda, and magnesia; the second of 5 grains each of salicylate of bismuth, β-naphthol, and powdered charcoal; and the third of 5 grains of salicylate of bismuth, salol, and bicarbonate of soda.

To *relieve the pain* of gastric cancer it will often be necessary to give opium; but when the pain is associated with, and dependent upon, acidity of the contents of the stomach, the administration of an alkaline carbonate will frequently effect this object without the need of having recourse to the preparations of opium. Both pain and vomiting may often be relieved by the following combination:—

℞	Sodii bicarb.	15 grains.
	Magnesii carb.	5 „
	Acid. hydrocyanici dil.	4 minims.
	Aquæ anethi	ad 1 oz.

M. f. haust. To be taken three or four times a day.

Severe attacks of pain will, however, require the use of opium. A great objection to its use is that by checking the hepatic and intestinal secretions and diminishing peristalsis, it aggravates the constipation and removes even the little appetite the patient may have. Its employment should be deferred as long as possible. Morphine, given hypodermically and combined with atropine, is, perhaps, the best method of administering it; a $\frac{1}{6}$ grain of sulphate of morphine and $\frac{1}{120}$ grain of atropine will usually suffice; this quantity must be increased if necessary. Another suitable mode of administering opium is to combine it with cherry-laurel water, as in the following:—

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* *Journal de Medicine*, 1890, p. 519.

℞ Liq. opii sedat.	5 minims.
Aquæ laurocerasi	30 ,,
Aquæ carui	ad 1 oz.

M. f. haust. To be given when the pain is severe.

If *vomiting* is persistent and unrelieved by hydrocyanic acid, or this combined with opium, oxalate of cerium will sometimes succeed in arresting it. One or two grains mixed with a few grains of sugar of milk may be given every three or four hours.

Or hydrochlorate of cocaine may be given—

℞ Cocainæ hydrochloratis	2 grains.
Aquæ laurocerasi	8 drams.
Aquæ destill.	ad 4 oz.

M. f. haust. A tablespoonful every hour until relieved.

Iced water or effervescing soda water or iced milk may be at the same time taken in small quantity, or fragments of ice may be sucked. Cold compresses to the epigastrium have been found useful.

The occurrence of serious *hæmorrhage* will require the same mode of treatment as that described for hæmorrhage from simple ulcer.

The constipation accompanying gastric cancer is best relieved by enemata, and these by unloading the intestine often greatly relieve the suffering caused by flatulent distension. In some cases a grain or two of watery extract of aloes, with two of soap, in a pill, daily, at bed-time is well tolerated.

Cajuput oil has been recommended for the relief of flatulence. It may be given in capsules, or it may be dropped on a small lump of sugar and swallowed.

When the more urgent dyspeptic symptoms have been relieved, and the patient is enabled to take and digest a sufficiency of suitable food, the anæmia and debility, which are always present in these cases, indicate the use of tonic remedies. We have found the following combination answer well :—

℞ Ferri et ammonii citratis	5 grains.
Liq. bismuthi citratis	20 minims.
Sodii bicarb.	10 grains.
Infusi calumbæ	ad 1 oz.

M. f. haust. To be taken three times a day, an hour before meals.

Or the following :—

℞ Ferri et quininæ citratis	5 grains.
Liq. strychninæ	3 minims.
Acid. hydrochlorici dil.	10 ,,
Aquæ	ad 1 oz.

M. f. haust. To be taken an hour after food, thrice daily.

Condurango bark was introduced by Friedreich as a remedy for cancer of the stomach, and recently its use and efficacy have again been testified to in the treatment of this disease. The most remarkable effects have been ascribed to its use in doses of 30 grains of the powder four or five times a day, or a decoction may be used. It has been said by some that it has always given relief, the pain has disappeared, the digestion has improved, and the tumour has either ceased to increase in size or has disappeared entirely. But it has not given such brilliant results as these in the experience of the majority of those who have tried it. It has, however, been established by experimental tests that it does increase the digestive secretions, the gastric juice, the bile and the pancreatic juice—especially the two latter; and that it may in this way do good in chronic disease of the stomach. Gerhardt has found it useful in the treatment of old gastric ulcer, and in cancer it has improved appetite and lessened the catarrh and hyperæsthesia of the gastric mucous membrane.

Reiss has made some careful and elaborate investigations into the effects of condurango in gastric cancer, and he concludes that an unprejudiced observer, after watching a large number of cases, would be decidedly of opinion that life is considerably prolonged by a course of treatment with it. Ewald also states that he has repeatedly observed the good effects of this drug on the general symptoms of cancer of the stomach, and he considers the observation of Reiss most important, and that his recommendation to give large quantities of this remedy should be followed.*

The surgical, operative procedures proposed for the relief of gastric cancer are the following:—

1. **Gastrostomy.** — This operation has been already referred to as a last resource in cases of œsophageal cancer. It may also be resorted to in cases where the cardiac orifice of the stomach is constricted by a cancerous growth, especially in cases of annular stricture; but it is less applicable in cases where the new growth is extensive and involves any considerable portion of the anterior wall and greater curvature—nor in any case is it likely to do more than prolong life for a short time. The operation is usually performed in two stages, and the stomach is not opened until adhesions have been established between the wall of the stomach and that of the abdomen. But when the urgency for administering some food is very great, it is easy to give some concentrated fluid food in small quantities, before the stomach is opened, by means of a larger kind of hypodermic syringe with a long needle—a syringe capable of holding half an ounce or an ounce, which can be repeatedly refilled (by removing it from the needle which remains in the stomach), until a few ounces of food have been introduced.

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* "Diseases of Stomach," vol. ii. p. 419.

2. **Gastrotomy.**—This operation, originally suggested for the purpose of extracting foreign bodies from the stomach, has also been applied by Dr. Bernays* to the treatment of cancer by means of the curette. An opening an inch and a half in length is made in the stomach wall, and its cavity well washed out and its interior explored. "The growth is removed partly by the finger-nail, partly by the sharp spoon. The stomach is finally irrigated by carbolised water." Dr. Bernays removed 14 ounces of growth in one case and 14 drams in another, and both patients were much relieved. It is difficult, however, to believe that this operation can be applicable to many cases.

3. **Pylorectomy,** or resection of the pylorus, an operation which is, of course, designed for the relief of malignant stricture of the pylorus. It consists in the removal of the pylorus and the adjacent portions of the stomach and duodenum; the divided walls of the stomach and the bowel are brought together and united by sutures. Ball,† of New York, has reported a successful case, the patient being alive ten months after the operation. After an exploratory laparotomy, the stomach was cut across about 2 inches from its pyloric extremity, and the duodenum about half an inch below the point to which the disease extended. The open ends were inverted and stitched up, after which the intestine was fastened to the stomach by one of Abbe's catgut rings. The portion removed was 4¾ inches long.

Pylorectomy in England has not been performed many times, and the mortality attending this operation has been very great. The mortality in fifty-five cases collected by Dr. Winslow reached 76 per cent.‡

The objections to this operation are—(*a*) that it is itself a very fatal one; (*b*) that there is great tendency to early diffusion of malignant disease when situated within the peritoneal cavity, and there is little chance of complete removal of the cancerous deposits; (*c*) the tendency of the growth to the contraction of firm adhesions to surrounding parts; (*d*) the great length of time required for the operation, and (*e*) the risk of speedy recurrence. If it should be urged that the operation is usually too long postponed, it must be remembered that in earlier stages there may be considerable uncertainty in diagnosis, and that many cases of scirrhus disease of the pylorus tend, with suitable feeding and medicinal treatment, to run a very prolonged course and live for many years in tolerable comfort. We have already referred to a remarkable instance of this kind.

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* Quoted by Mr. Treves in his "Operative Surgery," vol. ii. p. 420.

† *New York Medical Journal*, April 18, 1891.

‡ Quoted by Mr. Treves, "Operative Surgery," vol. ii. p. 436.

4. **Gastro-enterostomy,** that is, the establishment of a permanent fistulous opening between the stomach and some part of the small intestine, usually the upper part of the jejunum.

Mr. Arthur Barker has recorded two successful operations of this kind,* and a considerable number have now been successfully performed, chiefly by the use of Senn's bone plates.

In Mr. Barker's first case the patient survived the operation fifty-three weeks, and was fairly comfortable for eight months.

In this operation it is, of course, extremely important to make the communication between the stomach and the *upper* part of the jejunum as near the pylorus as possible. Cases have been examined *post-mortem* in which the juncture was found to have been made but a short distance from the ileo-cæcal valve!

This operation affords, perhaps, the best chance of successful relief in cases of malignant stricture of the pylorus, when the sufferings of the patient are urgent and the failure in nutrition is rapidly progressing.

5. **Jejunostomy.**—When owing to the situation

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* The first in the *British Medical Journal*, February 13, 1886; and the second in the same journal, January 9, 1892.

of the carcinomatous growth it is not practicable to make any operation upon the stomach itself, life has probably been prolonged by making a fistulous opening into the jejunum and introducing food through this channel.

The advantages of this operation are its simplicity and the quickness with which it can be performed; it avoids the obviously great risks of gastro-enterostomy and of pylorectomy, and the malignant growth is afforded complete rest, and thus the strictured orifice may possibly become again to a certain extent pervious. We lose, however, entirely the aid of gastric digestion, and the patient has to trust altogether to intestinal digestion.

Loreta's operation for the forcible divulsion with the fingers, after gastrotomy, of a stricture of the cardiac or pyloric orifice of the stomach is only applicable to non-malignant fibrous cases. Mr. Treves has applied this method successfully in a case of pyloric stricture, the patient having had no return of his symptoms when seen two years after the operation.*

ADDITIONAL FORMULÆ.

Mixture in gastric ulcer.

℞ Bismuthi carbonatis, 2 drs.
Acidi hydrocyanici dilut, 1 dram.
Liquor. morphinæ hydroch., 1 dram.
Mucilaginis recentis, 6 drs.
Aquæ chloroformi ad 2 oz.

M. f. mist. A teaspoonful every three hours. (*Whitla.*)

Mixture for gastric ulcer with hæmatemesis.

℞ Ferri sulphatis, 5 grains.
Magnesii sulphatis, 1 dram.
Acidi sulphurici diluti, 10 minims.
Aquæ menthæ pip. ad 1 oz.

M. f. haust. To be taken three times a day. (*Saundby.*)

In convalescence from gastric ulcer.

℞ Syrupi aurantii corticis, 5 drams.
Decoct. condurango (1 to 9) ad 6 oz.

M. f. mist. A tablespoonful three times a day. (*Bamberger.*)

Mixture in gastric ulcer.

℞ Bismuthi carbonatis, 2 drs.
Sodii bicarbonatis, 1 dram.
Tinct. belladonnæ, 1 dram.
Infusi gentianæ ad 6 oz.

M. f. mist. Two tablespoonfuls three times a day. (*Ord.*)

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* "Operative Surgery," vol. ii. p. 422.

In gastric ulcer with hæmatemesis.

℞ Plumbi acetatis, 3 grains.
Morphinæ hydrochlor., 1½ gr.
Sacchari albi, 1 dram.

M. et divide in pulv. 10. A powder every two hours (*Bamberger.*)

Or,

℞ Acidi tannici, 12 grains.
Opii pulv., 1½ to 2 grains.
Sacchari albi, 1 dram.

M. et divide in pulv. 6. A powder every two hours. (*Bamberger.*)

Alkaline and rhubarb powder for gastric ulcer.

℞ Sodii bicarb., 2 drams.
Potassii bicarb., 2 drams.
Pulv. rad. rhei, 4 drams.
Sacchari lactis, 1 oz.

M. f. pulv. As much as will go on the end of a knife to be taken dry every hour. (*Ewald.*)

In gastric ulcer with flatulent dyspepsia.

℞ Potassii iodidi, 6 grains.
Potassii bicarbonat., 1½ drm.
Tinct. aurantii, 3 drams.
Infusi calumbæ ad 6 oz.

M. f. mist. Two tablespoonfuls an hour after food. (*Brinton.*)

For vomiting in gastric ulcer.

℞ Potassii iodidi, 1 dram.
Tinct. cinchonæ, 1 oz.

M. Ten to twenty drops several times a day. (*Lebert.*)

For gastric ulcer.

℞ Argenti nitratis, 15 grains.
Aquæ destill., q.s.
Ext. belladonnæ, 10 grains.
Ol. caryophylli, 10 drops.
Pulv. rad. gentianæ, q.s.
Extracti gentianæ, q.s.

M. et divide in pil. 40. One three times a day. (*Bartholow.*)

For anæmia in gastric ulcer. Effervescent iron powder.

℞ Ferri lactatis, 40 grains.
Acidi tartarici, 2 drams.
Sodii bicarb., 3 drams.

M. f. pulv. (The powder to be kept in a wide-mouthed stoppered bottle.) Half a teaspoonful to a teaspoonful in a small wineglassful of water two or three times a day. (*Lebert.*)

Resorcin and condurango for gastric cancer.

℞ Resorcin puri, 30 grains.
Tincturæ rhei, 1½ dram.
Syrupi aurantii, 5 drams.
Decoct. condurango (1 in 12) ad 6 oz.

M. f. mist. One tablespoonful every two hours. (*H. Menche.*)

Condurango mixture for gastric cancer.

℞ Condurango bark, 150 grs.
Aquæ, 3 oz.
Boil for ten minutes, and add
Syrupi, 5 drams.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful every hour or two. (*Reiss.*)

As an antiseptic in gastric carcinoma.

℞ Sodii sulphitis, 30 to 60 grs.
Infusi quassiæ, 1½ oz.

M. f. haust. To be taken three times a day. (*Jenner.*)

To relieve pain in gastric carcinoma.

A mixture of bismuth and iodide of potassium. (*Ord.*)

CHAPTER V.

DISEASES OF THE STOMACH—THE TREATMENT OF DILATATION OF THE STOMACH, OR GASTRO-ECTASIS.

Dilatation of the Stomach—Causes—Symptoms—Vomiting—Physical Examination—Indications for Treatment—Dietetic Measures—Model Dietary—Emetics—Purgatives—Carlsbad Water—Tonics—Electricity—Massage—Antiseptics—Lavage—Hydrotherapy—The Stomach Siphon and Pump—Surgical Operation—Counter-indications.

Dilatation of the stomach is an almost necessary consequence of stricture or obstruction at the pylorus, malignant or non-malignant, arising in the walls of the stomach itself or external to it, and the treatment of this condition has been incidentally referred to in discussing the management of cases of gastric cancer.

But there are other causes of gastric dilatation, a morbid state which has no doubt been frequently overlooked, and its symptoms described under the less definite headings of "atonic" and "putrid dyspepsia." It is to these causes we must, in the first place, refer.

The habitual consumption of excessive quantities of food or drink is calculated to lead, in course of time, to dilatation of the stomach, by repeated abnormal distension of that organ. Dilatation may also originate in an enfeeblement of the muscular coat of the stomach, brought on by debilitating diseases, such as chlorosis and anæmia, tuberculosis, typhoid and other fevers. Adhesion of the stomach to an adjacent organ, as, for instance, from the local peritonitis set up by a perforating ulcer, may also cause dilatation by interfering with its muscular movements. Chronic gastric catarrh is a common cause of dilatation of the stomach, for not only does it lead to impairment of muscular contraction from defective nutrition, but as the secretion of gastric juice is defective and absorption therefore retarded, the food is delayed in the stomach, abnormal fermentation is set up, and flatulent distension, as well as accumulated ingesta, increases and aggravates the dilatation due to enfeeblement of its walls.

Retained ingesta, from whatever cause, and enfeeblement of the muscular walls of the stomach, however produced, are the essential conditions of gastric dilatation,* increase of pressure from within, or diminished resistance in the walls of the stomach, or both together.

Cases of *acute* dilatation seem in all instances to be due to atony of the muscular walls brought about usually by exhausting illnesses. Clifford Allbutt states that he has often found it existing in moderate degree in cases of phthisis, and that it has been especially instrumental in retarding or preventing recovery. Many careful observers have also directed attention to its frequent occurrence in infants and young children. Both in breast-fed and hand-fed infants of feeble digestive power this morbid state may be detected—the digestive processes are retarded, and as the child is constantly being fed, food accumulates, and is abnormally retained in the stomach, where it undergoes fermentive changes.†

The coincidence of gastric dilatation with symptoms of nervous depression, hysteria, and hypochondriasis has prompted the suggestion that the nervous conditions may have preceded and caused the dilatation.

It has been pointed out that an ulcer situated near the pylorus may cause spasmodic stricture of that orifice, and consequent dilatation of the stomach, and if the ulcer is healed the stricture and dilatation will disappear.

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* Prof. Clifford Allbutt contends that "in the majority of cases of gastro-ectasis this morbid state is more often due to failure of resistance (in the walls of the stomach) than to excessive pressure within." (*Transactions* of Medical Society of London, vol. lxi. p. 8.)

† "The epigastrium protrudes and tightens, the stools grow costive, pale, and offensive; the child becomes fretful, rejects some mucus and altered food, and its flesh fails rapidly. By palpation and percussion a dilated stomach is often found to be present." (Dr. Clifford Allbutt, *Transactions* of Medical Society of London, vol. xl. p. 10.)

The consequences of dilatation of the stomach, however induced, are the lingering of food in that organ and the setting up of morbid fermentation and the production of toxic putrid substances, such as poisonous ptomaines. So that not only is the general nutrition gravely compromised, but the absorption of toxic substances tends to further seriously disturb the health of the patient.

The **symptoms** of dilatation of the stomach when this is caused by pyloric stenosis will, of course, have been preceded by those of the original disease. But dilatation of the stomach, from whatever cause, is usually attended with a group of more or less characteristic symptoms, some of which are, however, common to other forms of dyspepsia.

There is usually a sense of weight and fulness about the epigastric region, aggravated by taking food, and not infrequently accompanied by a constant wearing pain referred mostly to a particular spot in the epigastrium which is sensitive to pressure. Heartburn and nausea, with foul, acid eructations of fluids and gases, the latter sometimes not only putrid but even combustible, are complained of, and the patient's countenance is usually thin, pale, worn, and anxious. There are also usually great general emaciation and loss of strength.

Vomiting, although not an essential symptom, frequently occurs, and in cases of considerable dilatation is very characteristic. The quantity vomited is sometimes enormous, and it gushes out as if pumped up from the stomach, and is often unattended by nausea. The vomited matters consist of turbid, sour, bad-smelling liquid, composed of tenacious mucus and the residue of half-digested food in a state of fermentive decomposition, with sarcinæ and other low organisms; if it contains also dark coffee-ground matters, there is reason to fear the existence of pyloric cancer, and if bright blood be present, that of gastric ulcer. One of the most characteristic points to be noticed in the substances vomited is the presence of portions of undigested food taken long, it may be days before! The vomiting often occurs at regular intervals of 24 or 48 hours, or even longer. There is usually loss of appetite, but occasionally there may be a morbid craving for food, due to the defective absorption of nourishment.

Constipation is a common accompaniment, consequent on the imperfect emptying of the stomach. Owing, also, to the small absorption of fluids, the urine, in advanced cases, is frequently diminished in quantity. Coldness of the extremities is usual, and dyspnœa and palpitation are often complained of. *Cramps* of the voluntary muscles have been often observed by Kussmaul, and referred by him to the abnormal dryness of the muscular and nervous tissues from deficiency of water in the blood.

Physical examination of the region of the stomach affords an important aid to diagnosis. In cases of great dilatation the stomach may be seen to bulge the abdominal wall, and its outline may be defined with distinctness. The outline of the stomach may be rendered more distinct by distending it with carbonic acid gas (as suggested by Frerichs), by first giving 20 to 30 grains or more of bicarbonate of soda, and then immediately afterwards 15 to 20 or more grains of tartaric acid, each dissolved in a little water. Movements of the stomach, especially if its muscular walls be hypertrophied, may also be sometimes seen through the thinned abdominal walls. A *splashing* noise may often be produced on shaking the patient when upright. This would not be diagnostic of itself, but would lend weight to the significance of other symptoms.

Percussion in the recumbent position usually reveals an extended area of gastric resonance, stretching upwards above the left hypochondrium, and downwards, to or below the umbilicus; and on assuming the erect attitude a band of dulness will usually be detected

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(caused by the gravitation of the fluid contents of the stomach) over the lower part of this area. It is rarely necessary to use Leube's stomach sound, but when introduced its point may usually be felt below the umbilicus, and it then indicates the lowest level of the greater curvature.

Clifford Allbutt points out that in acute or early cases, before the whole stomach is dragged down, it is as important to note the situation of the upper line of the stomach as that of the lower, which he has found to reach as high as "the fourth or even the third rib." This seems very high, and would involve considerable dyspnœa and palpitation, as the diaphragm would be pushed up to this extent and the action of the heart and the expansion of the lung much embarrassed.

Having now passed in brief review the causes and symptoms of gastro-ectasis, we must, in the next place, consider what modes of treatment are best calculated to cure or alleviate this affection.

The following **indications** for **treatment** are sufficiently clear, the only question is how best to carry them out.

1. To remove the decomposing residue of food, and cleanse the stomach.
2. To prevent putrid fermentation by antiseptics, and by other means, such as careful dieting.
3. To impart tone to the feeble muscular walls of the stomach, to promote gastric digestion, and to supply nourishment, if necessary, in other ways.
4. To remove constipation.

In advanced cases with great and long-existing distension it will be difficult to carry out these indications except by the mechanical emptying and washing out of the stomach; but in less advanced cases of simple dilatation from atony of the gastric walls, and not dependent on organic obstruction, we believe that other means, medicinal and dietetic, will suffice, if diligently carried out, to effect a cure. When there is no objection on the part of the patient to "lavage" of the stomach and nothing in the history of the individual case to contra-indicate it, it may be applied in both classes of cases; but great reluctance to submit to this treatment, especially in slight cases, is often encountered, and it is necessary, therefore, to be ready with other measures.

Leaving at present for subsequent consideration the application of "lavage," we will proceed to consider those other remedies.

And first, with regard to the necessary dietetic measures: it has been said that in such cases we should order small quantities of food frequently: it is certain that the food should be *small* in quantity, concentrated and easy of digestion, or pre-digested; but we entirely object to *frequency* of feeding.

In such patients the process of digestion is often excessively slow, and even small quantities of food, if given frequently, will tend to accumulate and undergo morbid fermentation.

The supply of liquids should be strictly limited, and only a very small quantity allowed to be taken at meals—not more than 3 or 4 ounces; and it is better, if possible, to put off taking even this amount until an hour after the meal. When there is a craving for fluids, it is a good plan to let the patient sip a teacupful of hot water half an hour before a meal; we shall thus lessen the desire to drink during the meal. And as a certain amount of water is needed for the physiological requirements of the body, and is also useful for cleansing the stomach, it is easy to supply this by causing the patient to drink a small teacupful of warm water or warm alkaline mineral water, such as Vichy, Vals, or Apollinaris, when the stomach is most empty, as, for instance, the first thing in the morning, the last thing at night, and half an hour before each meal.

Ewald lays great stress on the need of abstaining from liquids; he says, "I only allow a small quantity of milk, from a tea- to a table-spoonful, taken at short intervals." Still, as we have already said, a certain amount of water is an absolute necessity, and this may be supplied, if care is taken to make the meals small and at long intervals, and then give the water in the way we have indicated when the stomach is empty.

As the food must be in small quantity, and therefore concentrated, it should be chiefly animal. The lean of tender meat from which all fibrous and tendinous structures have been removed is the best, and when there is any uncertainty as to its due mastication by the patient it had better be mechanically divided by **mincing** or pounding before it is taken. Chicken, white game, fish (the more delicate kinds), lightly-boiled eggs, are also suitable forms of animal food. Starchy foods (carbo-hydrates) must be taken in small quantity only, as they are prone to linger in and set up acid fermentation in the feeble, dilated stomach. All vegetable substances that tend to produce flatulence must be rigidly discarded. A small quantity of the most concentrated and easily-digested fresh vegetables may be taken in the form of *purées*. Some of the light farinaceous foods may also be taken in small quantities at a time, as tapioca, sago, rice, and macaroni, or the crumb of a stale roll or a little dry toast (1½ to 2 oz. daily).

It is highly desirable, however, that the animal and vegetable foods should not be taken *together*, but certain meals should consist *wholly* of concentrated animal food, and others wholly of carbo-hydrates or *purées* of fresh vegetables. Carbo-hydrates, being digested in the small intestine, their presence in the stomach together with animal food only retards the digestion of the latter. If the dilatation depends on stricture of the pylorus it will be desirable to limit the food *entirely* to such substances as can be absorbed in the stomach, at any rate for a time, *i.e.* to *nitrogenous* animal substances. Butter, sugar, and all sauces must be forbidden.

It may be desirable, in some severe cases, attended with troublesome vomiting, to adopt for a time a strictly milk diet, giving the milk mixed with crushed ice in small quantities at a time and at suitable intervals. *Condensed* peptonised milk is warmly praised by Ewald.

Prof. Bouchard has most wisely insisted on the necessity of keeping the meals as far apart as possible; nine hours, he says, should intervene between breakfast and dinner, and fifteen between dinner and breakfast. We have ourselves no doubt that one reason why dietetic measures fail in some of these cases is that food is allowed to be taken too frequently, gastric digestion being *very slow* in many of these patients. Dujardin-Beaumetz also insists that there should be no eating between breakfast at 11 a.m. and dinner at 7.30 p.m.

It is best that the drink should be pure water, but a little red wine, well diluted with water, may be allowed. Tea, coffee, or cocoa, certainly during the early part of the treatment, should be wholly forbidden. Subsequently, when digestive power has been to a certain extent regained, a little unsweetened tea or coffee may be occasionally permitted.

Much use may be made, as Ewald points out, of **nutrient enemata** in these cases. They prove an essential aid to the supply of nourishment, and by their help we may for days keep the stomach almost entirely unoccupied. They also afford a means of supplying water to the system, which is greatly needed. If a long, flexible tube is used, and passed up for ten or twelve inches, the patient being in the knee-elbow position, a considerable quantity (8 or 10 oz.) of fluid food will be retained at a time.

The following sketch of a model dietary for cases of dilatation of the stomach may prove useful :—

7.30 A.M.—A small teacupful of hot water.

8 A.M.—*Breakfast.*—Two poached eggs, or a small grilled sole flavoured with lemon-juice, 1 oz. of thin toast, followed by 2 to 4 oz. of beverage—water, or hot milk and water (if milk agrees).

1.30 P.M.—A small teacupful of hot water, as at 7.30.

2 P.M.—*Luncheon.*—4 oz. of boiled rice, or tapioca, or sago, with a little fruit jelly; or macaroni, with a little grated cheese; 4 oz. of water, or weak brandy and water. } A little cream may be used in preparing these.

7.30 P.M.—A cup of hot water, as at 7.30.

8 P.M.—The lean of a mutton chop; or a slice of the lean of roast or boiled mutton or chicken; or roast beef (not more than 3 oz.); 1 oz. of purée of potato, 1 oz. of dry toast; 4 oz. of water, or weak brandy and water.

11 P.M.—Half a tumblerful of Vichy water.

A cup of milk and water (Vichy) or of cold beef-tea may be taken during the night if the need for food be felt.

This dietary admits of obvious variations, in accordance with the principles laid down.

Kussmaul has advised that the patient should wear an abdominal bandage, and should lie on the right side the greater part of the day so as to promote the escape of food from the dilated stomach. The bandage, especially if accompanied by a light epigastric pad, causes more intimate contact of the contents of the stomach with its walls, and consequent increase of movement and secretion.

Before proceeding to apply some such dictary, or to make use of the medicinal means, we shall immediately describe, it is undoubtedly desirable to cleanse the stomach of its decomposing contents and morbid secretions; and when the patient objects to this being done with the stomach pump, or siphon tube, there are still two other measures, either of which may prove satisfactory.

We may empty the stomach by means of an emetic. Dr. Hare has prescribed 24 grains of powdered ipecacuanha for this purpose with excellent results,* and never found any considerable depression follow its use. It has, however, been objected to the use of emetics (*Leube*) "that they never secure a complete expulsion of the fermenting ingesta," and that in advanced cases the loss of muscular tone is so great that it is difficult if not impossible to excite vomiting.* In such cases the use of purgatives is preferable, and good results have been obtained by the use of Carlsbad water for this purpose. A glass of the water should be given cold every half hour, in the morning, fasting, until it causes an action of the bowels. By this means the residue of ingesta is carried off through the pylorus, and the Carlsbad water is said also to relieve the coexisting gastric catarrh. It is often necessary to increase the purgative effect of the natural Carlsbad water by adding a teaspoonful of the Carlsbad salts to each glass. We consider this a good plan of treatment in dilatation due simply to atony of the gastric walls, and we have also known instances of organic obstruction greatly benefited by the Carlsbad cure.

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* *Transactions* of Medical Society of London, vol. xi. p. 20.

The plan of attempting to increase the digestive activity of the stomach by giving 10 or 15 drops of dilute hydrochloric acid after each meal, with or without 3 or 4 grains of pepsin, has many advocates, and certainly should not be overlooked. Ewald advises this dose of hydrochloric acid to be given every hour, in a tablespoonful of water, through a glass tube, and in cases of carcinoma to give it in infusion of condurango. Bitters to promote gastric secretion and strychnine or nux vomica to restore tone to the gastric muscle are useful in many cases. Three or four minims of liquor strychninæ, or 15 to 20 minims of tincture of nux vomica, with 10 of dilute hydrochloric acid and an ounce of infusion of calumba should be given an hour after food three times a day. Or if there are acid eructations or complaints of heart-burn, it may be better to give the tincture of nux vomica and the infusion of calumba with 15 or 20 grains of sodium bicarbonate an hour before meals.

External faradic applications have also been found of use in restoring tone to the gastric muscles. *Massage* has likewise been found useful, and it seems possible by this measure not only to promote the passage out of the stomach of the residue of the food retained there, but also to rouse, to a certain degree, the tone of its muscular walls.*

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* Von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. vii. p. 332.

The *constipation*, when it exists, must be overcome, either by saline aperients, as Carlsbad water, taken in the manner already described, or by a pill of aloes, soap, and ipecacuanha every night if necessary.

℞ Aloes pulv....	1 to 3 grains.
Ipecac. pulv.	$\frac{3}{4}$ grain.
Saponis	1 ,,

M. f. pil.

Ewald has given subcutaneous injections of aloin with good results.

The usefulness of **antiseptic** agents for the purpose of preventing putrid decomposition of the contents of the stomach is now widely recognised.

Pills of creasote or of thymol, taken immediately after food, or sulphurous acid in dram doses, or salicylate of bismuth (℞ Bismuthi salicylatis, magnesii carb. āā 5 grains; m. f. pulv.; to be taken after each meal), or chloroform water may be given both for its sedative and antiseptic effects.

Dr. McNaught † has recorded a case of dilatation of the stomach from pyloric stenosis attended with eructations of *inflammable* gas, in which *salicylate of soda*, together with *lavage*, proved very useful in arresting the tendency to morbid fermentation. He gave it in doses of 15 grains with other medicines, and made the patient, after washing out the stomach, take 30 grains dissolved in half a pint of water.

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* Hirschberg ("Massage de l'abdomen," *Bull. de Thérap.*, 1887, t. cxii. p. 248) recommends the following mode of applying massage in cases of dilatation of the stomach:—First, by means of percussion and succussion the lower limit of the dilated organ is marked out, then with the palm of one or of both hands pressure, at first very gentle and afterwards gradually augmented, is made, passing from the left and lower limit towards the pyloric region. Then, placing the ends of the fingers stretched out over the inferior and left boundary of the stomach, light pressure is made with them, passing as before towards the pylorus. The pressure, at first slight, should be progressively increased. After five or six minutes of these manipulations, kneading and compression of the stomach should follow; then pushing the fingers down as far as possible, we should try to knead gently and lightly the contents of the stomach, pressing at the same time with the hands from below upwards and from left to right.

† *Brit. Med. Journal*, 1890, vol. i. p. 470.

Small doses of calomel frequently repeated, $\frac{1}{6}$ to $\frac{1}{2}$ a grain, three times a day, have been found in many cases to act better than any other remedy as a gastro-intestinal antiseptic.*

An important adjunct to these other measures is regular exercise in the open air—preferably the air of the country; gentle gymnastic exercises are also useful, and the circular douche applied to the region of the stomach, the spinal douche, and other tonic hydro-therapeutic treatment, by raising the general tone of the nervous and muscular systems, will often prove of great assistance in treating these cases.

Finally, we approach the consideration of the mode of treating dilatation of the stomach, so strongly advocated by Kussmaul and Leube, and adopted by many other physicians, viz. the mechanical emptying and **washing out** the stomach by the stomach pump or siphon tube. Leube says, "With the introduction of this practice the treatment of dilatation of the stomach has for the first time become a rational one, and all other remedies sink by comparison into the second and third rank;" and Ewald says "the advantages resulting from this method are evident, and the only wonder is that it was not made use of earlier." This radical measure, when it is well tolerated by the patient, is no doubt one of the most efficacious of curative processes, but it is intolerably repugnant to many. Ebstein† has applied this method even to infants under a year old, using a No. 8 to 10 Nelaton's catheter, and washing the stomach out with warm water containing a little benzoate of magnesia.

In England Clifford Allbutt has strongly advocated this mode of treatment.* He uses either plain warm water or water containing a little borax in solution. He uses the stomach pump at first when the contents of the stomach are "bulky and lumpy," and he has seen no harm attend its use, as has been suggested, from its suction action on the mucous membrane. "With a large lateral opening in the tube, and careful exhaustion, there is practically no likelihood of harm." The siphon tube can be employed later, and may be managed by the patient himself.

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* Dr. William Carter, of Liverpool, "On the Operation of Ferments in Disease."

† *Arch. für Kinderheilkund.* Bd. iv. s. 325.

Leube prefers the stomach pump, and does not approve of the patient being left to wash out his own stomach. "The siphon has the disadvantage that it can withdraw from the stomach only fluids or substances which are very nearly fluid, and resort must be had to the pump to remove the remnants of the ingesta . . and the removal of the ingesta to the fullest extent possible is altogether the most important indication . . The operation of washing out the stomach when intrusted to the patient alone is attended with so many risks from his unavoidably awkward movements in connection with the protrusion of the lower wall of the stomach by the end of the tube, that I cannot but regard the relegation of the operation to the patient himself as extremely hazardous." †

When, however, the stomach tube is made of soft rubber, as in the instrument to be described, there is no danger of the patient injuring himself, and the simplicity of the siphon arrangement has much to recommend it, although no doubt the washing out of the stomach is not so complete as with the stomach pump, and it may be advisable to commence with the latter instrument, as Clifford Allbutt advises.

The **stomach siphon**, as described by Faucher, consists of a soft rubber tube not less than 50 or

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* *Transactions* of the Medical Society of London, vol. xi.

† Leube on "Diseases of the Stomach." Von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. xi. p. 328.

60 inches in length provided with a projecting index to show to what depth it should be allowed to pass down into the stomach. These tubes can be obtained of three sizes (Nos. 1, 2, and 3), having respectively a diameter of 8, 10, and 12 millimètres. A glass funnel is fitted to its outer end (Fig. 4).

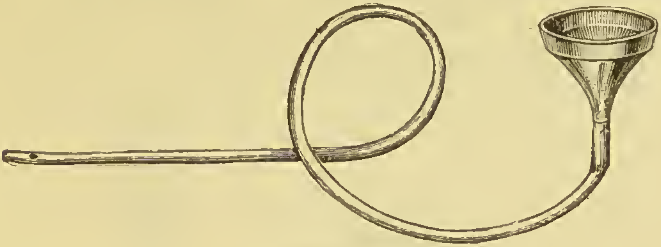

Fig. 4.—Stomach Siphon.

Debove has suggested a modification of this, in which that portion of the tube which is passed into the stomach is made somewhat less supple and more resistant, though still quite elastic, so that it can be pushed more easily down the œsophagus and into the stomach (Fig. 5).

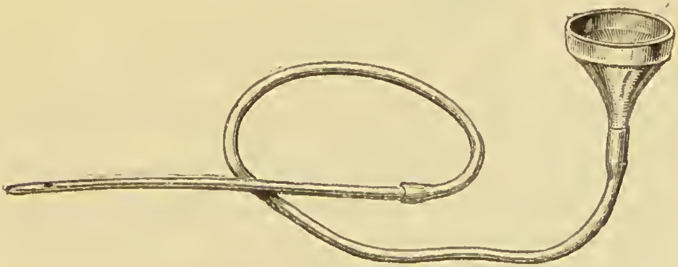

Fig. 5.—Stomach Siphon (Debove's Modification).

In first using the stomach tube it is best to begin with the smaller size, and when the patient is accustomed to its use to employ the larger ones. The tube is introduced into the pharynx in the same manner as an œsophageal bougie, you then direct the patient to make efforts at swallowing as you push the tube down into the œsophagus. The tube should be dipped into milk to moisten it before passing. When the tube has passed as far as the index marked on it you affix the funnel to the outer end, and fill it with the fluid you wish to introduce into the stomach (Fig. 6); the moment you observe that the fluid has nearly disappeared you lower the funnel rapidly, and the liquid contents of the stomach flow out into the vessel you have placed to receive them (Fig. 7).

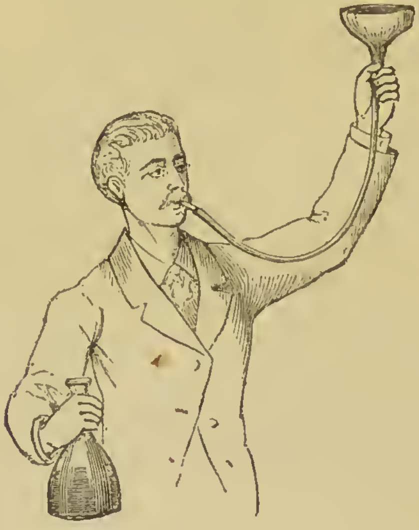

Fig. 6.—Mode of using Stomach Siphon.

Sometimes some difficulty occurs in the introduction of the tube owing to its provoking nausea, or efforts at vomiting, or even attacks of dyspnœa. This is especially the case in persons with great irritability of the fauces and pharynx: in such persons it is best to paint these parts with a 5 per cent. solution of chlorhydrate of cocaine about ten minutes before attempting to introduce the siphon. Toleration of the presence of the tube in the pharynx and œsophagus is, however, rapidly established, and the patient may after a few days be encouraged to pass the tube himself.

It is usual to employ some slightly alkaline water for washing out the stomach—warm water containing about 2 grains to the ounce of sodium of bicarbonate is the best. Sometimes it is desirable to use an antiseptic fluid, such as a saturated solution of boric acid, or creasote water, or a 1 per cent. solution of sodium salicylate, or sodium hyposulphite, or some tincture of myrrh may be added to the water in cases of atonic dyspepsia. Of all these the boric acid solution is the best. If there is complaint of pain in the stomach you may mix some subnitrate of bismuth with the water put into the funnel, and allow it time to deposit itself on the mucous membrane of the stomach, or you may use chloroform water (2 per cent.) with the bismuth, and this has both an anæsthetic and an antiseptic action. As to the quantity of fluid to be used at each washing, this will depend on the tolerance of the patient, and the degree of dilatation of the stomach; but, if possible, the washing-out should be continued until the fluid that flows out is as clear and pure as that which is flowing in.

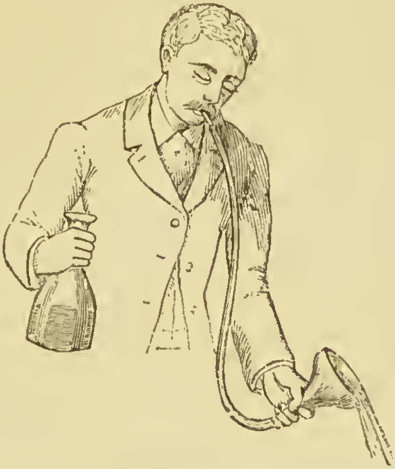

Fig. 7.—Mode of using Stomach Siphon

Occasionally the outflow of fluid suddenly ceases, especially if the tube has only one opening at its gastric extremity (it should have two), owing to this opening becoming blocked by particles of food; this can usually be washed away by allowing some more fluid to flow into the stomach. Sometimes the opening of the tube in the stomach may not be in contact with its liquid contents; this may occur when the dilatation is very great, and out of reach of the tube, or if too much of the tube has been introduced it may bend on itself, and the opening may thus reach the upper and empty part of the stomach. A little manipulation of the tube will usually surmount either of these difficulties. Care must be taken that the stomach tube be not swallowed. The best time to practise washing-out is in the morning, fasting, and once a day is often enough. After a little time, once every two or three days will suffice.

The siphon, however, will not suffice, as Leube has stated, for all cases. In cases of malignant stricture of the pylorus, with enormous distension of the stomach with putrid substances, the stomach pump will often be necessary to adequately cleanse its cavity.

Another method of employing the siphon tube devised by Rosenthal, is shown in the accompanying illustration (Fig. 8).

To the outer end of the stomach tube is fixed a Y-shaped glass tube, one branch of which is connected with an elastic tube running to an irrigator containing the fluid to be introduced into the stomach, and standing at some height above the patient's head; the other branch is connected with the outflow tube which descends to a suitable receptacle. Fluid runs into the stomach through the tube connected with the irrigator, the outflow tube being compressed by the fingers of the left hand. If the outflow tube be kept open while the fluid is flowing from the irrigator, and if then, after the establishment of a column of water in the outflow tube, the irrigating tube be compressed with the fingers of the right hand, or its stop-cock closed, a siphon communicating with the stomach is formed, and empties this organ of its fluid contents.

The results obtained from the application of the method of washing out the stomach vary in different cases. In some immediate relief and ultimate cure are observed; in others we find more or less speedy relief and apparent cure, but frequent relapses, requiring reapplication of the treatment; there are other cases in which recovery is slow and gradual,

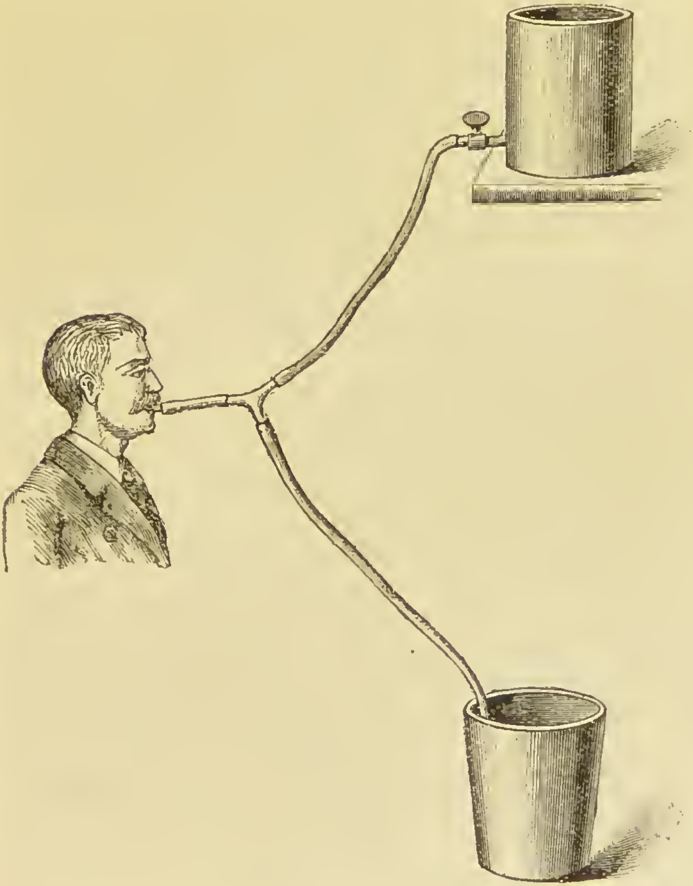

Fig. 8.—Stomach Tube and Irrigator.

and the treatment necessarily prolonged and tedious; others in which benefit attends the application of the method, but it has to be continued for the remainder of the patient's life; and others in which no benefit is obtained.

It must also be borne in mind that there are certain cases in which the use of the stomach tube is **counter-indicated**—for instance, when the attempt to introduce it causes so much pharyngeal spasm, or distress from nausea and vomiting as to be seriously injurious to the patient; the existence of great debility; the recent occurrence of hæmorrhage from the stomach; most cases of gastric ulcer; cancer of the cardiac orifice, or of the œsophagus, and aneurism of the aorta. In all these circumstances we must have recourse to those other methods of treatment already detailed.

In cicatricial stricture of the pylorus forcible digital dilatation has been successfully carried out by Loreta of Bologna and other surgeons. The mortality in the latest batch of cases collected was 25 per cent. Heinecke's cutting operation had been followed by the same mortality.* Ewald indulges in the remarkable prophecy that "the time perhaps is not far distant when a lanceolate or leaf-shaped piece will be excised from a dilated stomach, in the same way as prolapse of the vaginal mucous membrane and uterus is treated, by means of a wedge-shaped incision"! †

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* Hare's "System of Practical Therapeutics," vol. ii. p. 969.

† "Lectures on Diseases of the Stomach," vol. ii. p. 363.

CHAPTER VI.

DISEASES OF THE STOMACH — THE TREATMENT OF HÆMATEMESIS, VOMITING, AND GASTRALGIA.

HÆMATEMESIS — Causes—Symptoms—Diagnosis — Indications for Treatment—Prophylaxis — Ergotin — Styptics—Local Applications—Aperients—Tonics—Transfusion.

VOMITING—Its Nature—Prevention—Pathology of Gastric Irritability—Treatment—Sedatives — Counter-Irritation — Anti-Fermentives — Sea-Sickness.

GASTRALGIA, OR GASTRIC NEUROSIS—Its Causes, Diagnosis, and Symptoms—Indications for Treatment—Anæmic, Malarial, Hysterical and Gouty Forms—Treatment of Paroxysm. Additional Formulæ.

HÆMATEMESIS.

IN considering the treatment of gastric ulcer and gastric cancer we have had to remark the frequent occurrence of hæmorrhage from the stomach in these diseases. There are many other conditions which may cause the effusion of blood into the cavity of the stomach, and it is the occurrence and treatment of gastric hæmorrhage from these other conditions, and in a *general* sense, that must now occupy our attention.

One of the most common causes of escape of blood into the stomach is *venous congestion* of its mucous membrane from obstruction to the circulation through the liver, especially from cirrhosis of that organ leading to compression of the branches of the portal vein. Any other obstruction to the circulation in the portal vein will produce a like effect; such as obstruction to the outflow of bile from closure or stricture of the hepatic, or common bile duct; the bile ducts then become distended, and compress the branches of the portal vein in the liver. Thrombosis of the portal vein would also have the same effect, and so, of course, would pressure upon it from a tumour of any kind in the transverse fissure of the liver.

Diseases which lead to the plugging or destruction of the capillaries of the liver, such, for instance, as acute yellow atrophy, may also cause congestion of and hæmorrhage from the gastric mucous membrane.

Increased pressure in the portal system from arrest of a regularly recurring hæmorrhoidal flux is sometimes attended with hæmatemesis.

Obstruction to the circulation through the heart and lungs, as in valvular cardiac disease and in pulmonary emphysema, may less directly, through the hepatic veins, tend to hæmorrhage from venous congestion of the stomach.

Hæmorrhage into the stomach may occur from disease of the coats of its vessels, atheroma, varix or aneurism, or from a *morbid permeability* of the vascular walls, together with a morbid state of the blood, as in the so-called hæmorrhagic diathesis, in malaria, in scurvy, in yellow fever, and some other affections, or the diseased vessel may be at the lower part of the œsophagus (varix)* and the blood may flow into the stomach and accumulate there; or it may flow back into the stomach from the duodenum; or an aneurism of an adjacent artery may rupture into the stomach.

We have seen how hæmorrhage into the stomach may be produced by erosion of its vessels from simple or cancerous ulceration; and erosion from the entrance of corrosive substances, or rupture of vessels from mechanical injury will, of course, be attended with the same results. Violent acts of vomiting sometimes lead to hæmorrhage. In some cases of severe and fatal hæmorrhage from the stomach it has been found impossible, on *post mortem* examination, to discover the source of the bleeding; it must have been wholly capillary and congestive.

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* Drs. Wilson and Ratcliffe (*British Medical Journal*, Dec. 27, 1890) have shown how a dilated and varicose condition of the veins at the lower end of the œsophagus may occur in cirrhosis of the liver, and so give rise to hæmatemesis, from a development in this situation of a collateral circulation, whereby blood from the portal vein can reach the heart without passing through the liver, and so relieve the portal engorgement. They believe that the hæmatemesis accompanying cirrhosis of the liver, and often referred to "general capillary oozing," is more commonly caused by this varicose condition of the lower œsophageal veins. The absence of symptoms of gastric ulcer and the freedom of the blood brought up from admixture with food from the stomach, together with the evidence of hepatic cirrhosis, should lead to a suspicion that the cause of the hæmorrhage is a varicose condition of these veins.

In the female sex, the occurrence of the menopause and of menstrual irregularities seems to exert an important influence on the frequency of the occurrence of gastric hæmorrhage.

The **symptoms** which reveal the occurrence of hæmorrhage into the stomach are the following: in the first place, there is usually *vomiting* of blood, but this symptom may be absent, and a small quantity of blood extravasated into the stomach may pass away by the bowels; when a large quantity of blood has been rapidly poured out, certain symptoms may precede the actual vomiting of blood, such as a sense of weight, fulness, and warmth, in the epigastrium, accompanied by nausea, an unpleasant sweetish taste in the mouth, and a feeling as of fluid rising in the œsophagus. As the hæmorrhage goes on the patient becomes pale, and complains of giddiness and faintness, of noises in the ears, and sparks of light in the eyes. The pulse is small and rapid, and the skin cold.

These symptoms may, however, be absent in smaller hæmorrhages and in robust persons. The blood vomited passes through the mouth, and sometimes through the nose, and is partly fluid, partly clotted, a portion may enter the larynx and excite coughing, and this must be borne in mind when the hæmorrhage is said to have been attended by coughing. There are occasionally cases of large hæmorrhage in which the blood is retained in the stomach and not vomited, and percussion over that organ shows that it is distended and dull from the presence of blood clot, while the general symptoms of severe internal hæmorrhage are present, such as pallor and coldness of the surface, collapse, pulselessness, tremors, and convulsions. Sooner or later, after the hæmorrhage, blood appears in the motions, usually in the form of a black, tar-like substance.

The appearances presented by the blood vomited depend on the time it has been detained in the stomach. If vomiting occurs at once the blood may be of a bright red colour and entirely fluid, but more commonly it is partly coagulated, and has the appearance of coffee-grounds or of soot mixed with water, the change in colour being due to the action of the gastric juice on the hæmoglobin. Sometimes portions of food, bile, and mucus may be mixed with the altered blood.

The usual symptoms of anæmia follow the loss of blood if it has been large; great pallor, coldness of the extremities, giddiness and faintness, spots before the eyes, and other affections of vision.

The alarming symptoms of gastric hæmorrhage usually pass away, and the patient recovers; and in cases of cirrhosis of the liver, some of the symptoms of the original disease have, occasionally, been ameliorated by its occurrence.

But if it recurs, as it is prone to do, frequently and in large amount, the patient must, of course, ultimately sink from exhaustion, if he does not die suddenly during an attack.

A few considerations as to **diagnosis** are necessary before we enter upon the discussion of the treatment applicable to these cases. There is usually little difficulty in deciding as to the source of the hæmorrhage when we have been familiar for some time with the previous history of the patient. The difficulty arises chiefly in those cases in which a loss of blood occurs suddenly and unexpectedly in a person who has not been recently under medical supervision.

This may occur sometimes in cases of perforating ulcer of the stomach, or in those cases of hæmorrhage from the stomach or lungs associated with menstrual irregularities; and in cases of early unsuspected phthisis. We must also bear in mind that blood is sometimes intentionally swallowed, and that it may be so, accidentally, when poured out from the mucous membrane of the nose, pharynx, or even the air passages during sleep.

We may conclude that the blood proceeds from the stomach in the following circumstances: The bringing up of the blood is preceded by nausea and an inclination to vomit; it is of dark colour (unless very considerable in quantity, when it may be bright); it is coagulated, contains no air bubbles, may be mixed with food, and has an acid reaction. It is followed by tar-like motions. It is *not* followed by the coughing up of blood-stained expectoration, nor are there any localised moist râles or any area of loss of resonance to be discovered in the lungs.

The indications for treatment in cases of hæmatemesis must necessarily depend on the nature of the original disease of which it is but a symptom. Many of these diseases are incurable, as will be evident in referring to what has been said under the head of causation; and when hæmatemesis occurs in the course of gastric cancer, or of chronic disease of the liver, heart or lungs, it is only as an incident in the course of these affections that its treatment has to be considered. The treatment appropriate to gastric ulcer we have already discussed.

In certain cases the opportunity of applying prophylactic measures may occasionally be afforded; if gastric hæmorrhage tends to occur at the menstrual period, a few leeches may be applied to the cervix uteri at the time the attack is threatened; if it is known to be dependent on hepatic cirrhosis, leeches may, in like manner, be applied to the anus so as to withdraw blood from the hæmorrhoidal veins; in chlorotic and scorbutic persons the general health should be strengthened by iron tonics and a hygienic regimen; and certain periodically-returning malarial attacks have been permanently arrested by the administration of quinine.

When hæmorrhage has actually occurred, the paramount indication is to diminish vascular pressure as far as possible. Fortunately, the escape of blood itself tends to do this, especially when it causes syncope, so that it has become an axiom that hæmorrhage tends to cure itself. In order, then, to quiet the action of the heart as much as possible, the most complete rest in the horizontal position should be insisted upon and maintained. The patient's anxiety should be calmed, and his room kept cool and quiet. No food should be given by the stomach for some days, that organ being kept quite at rest so as to avoid the risk of dislodging the fibrinous plugs in the bleeding vessels. Such nutriment as is needed must be administered by the rectum.

But what means are there at our disposal for arresting the bleeding when it appears to go on almost unchecked or recurs at short intervals?

Ergotin injected hypodermically appears to have decided hæmostatic properties, and if there is reason to think the bleeding is from arterial sources it is likely to be useful. Five to ten minims of the hypodermic injection of the B.P. may be injected every two or three hours; or a solution of *ergotinine* in chloroform water (1 in 1,000), with a little *lactic acid* to help it dissolve may be used instead and in the same dose. It is an effective preparation.

The so-called *styptics*, ferric perchloride, lead acetate, tannin, alum, turpentine, can be of little or no use when the stomach is partly filled with blood and half-digested food, as they could not then come into contact with the bleeding mucous membrane; but they may be of value in arresting the oozing of blood from the surface of the stomach after its contents have been removed by vomiting.

Alum and sulphuric acid. 5 grains of alum and 20 minims of dilute sulphuric acid in an ounce of iced water, may be given in quickly repeated doses in cases where we have reason to think there is continued oozing of blood into the stomach; or we may give 20 minims of solution of perchloride of iron in an ounce of iced water for the same purpose.

Or the following mixture may be found valuable where there is much gastric irritability:—

℞ Plumbi acetatis	30 grains.
Acid. aceti. dil.	2 drams.
Liq. opii sedat.	30 minims.
Aquæ caryophyll.	ad 6 oz.

M. f. mist. A tablespoonful every hour.

The local application of cold is usually an efficacious remedy. Ice pounded and mixed with bread crumbs may be applied to the epigastrium in the form of a poultice; small fragments should also be frequently swallowed; this also relieves the thirst and checks the tendency to vomiting.

The *syncope* may be relieved by the horizontal position, the head being kept low. Smelling-salts may be applied to the nostrils, and cold water sprinkled on the face, and the temples bathed with *eau de Cologne.* When the syncope is dangerous, one of the best measures to have recourse to is the hypodermic injection of ether, 20 or 30 minims at a time, repeated at short intervals; or camphor and ether combined may be used.

Giving stimulants by the stomach should, if possible, be avoided.

If there is a tendency to vomiting, sinapisms may be applied to the epigastrium, and 3 or 4 minims of dilute hydrocyanic acid in a tablespoonful of iced water may be given every hour or two for four or five times. A small quantity of iced champagne is occasionally useful in checking the vomiting.

In cases of cirrhosis of the liver the *after-treatment, i.e.* after the hæmorrhage has ceased, should include the daily use of an aperient composed of the alkaline sulphates; this will tend to relieve, or prevent engorgement of the portal system.

℞ Sodii sulphatis	1 to 2 drams.
Magnesii sulphatis	½ to 1 dram.
Aquæ cinnam.	1½ oz.

M. f. haust. To be taken early in the morning.

The resumption of feeding by the stomach must be attempted with great caution, and nothing but fluid and non-irritating foods administered for some considerable time.

Restorative blood tonics will be needed in many cases to remove the anæmic condition dependent on the loss of blood.

Transfusion has been suggested in cases of impending death; the great risk in its adoption is the danger by increasing the blood pressure of re-opening the injured vessels. It may be permissible in extreme cases and only in such, and then the quantities injected at a time should be very small. It is, however, a valuable measure for relieving the profound anæmia left in some cases, but it should only be applied some time after the hæmorrhage has ceased.

The injection of a ¾ per cent. solution of common salt into a vein, or its subcutaneous injection into the connective tissue, is believed by many authorities to be as useful as transfusion, while it is certainly far more convenient.

When there is reason to believe that the blood proceeds from the rupture of varicose veins at the lower part of the œsophagus the treatment should be modified accordingly; and Dr. Stacey Wilson, of Birmingham, to whose interesting paper on this subject we have already referred, rightly urges the necessity of keeping the œsophagus completely at rest so as to favour coagulation in its veins; he suggests that even the swallowing of ice may do more harm than good. Ergotin should be avoided, as calculated to do harm, by driving the blood from the arterial into the venous system. He also suggests the possibility of nitrite of amyl being useful by drawing rapidly a large amount of blood into the capillaries, and so reducing the blood pressure in the veins. If we could be *absolutely certain* of our diagnosis this suggestion might be valuable.

VOMITING.

Vomiting is, as we have seen, a symptom common to most diseases of the stomach, and it occurs also in a number of other diseases, *e.g.* in whooping cough, in phthisis, in renal disease, in meningitis, in hysteria, etc., etc., and its appropriate treatment as a symptom of these several maladies, must necessarily be considered when we discuss the treatment of these diseases themselves. But vomiting also not infrequently occurs as a morbid phenomenon occupying, by itself, almost the whole of the stage, so to speak; as, for instance, in sea-sickness, and it will be convenient and profitable here to consider briefly its treatment in a general sense and apart from its occurrence as an almost constant complication of certain morbid states.

The **act of vomiting,** whether the irritation causing it be central or peripheral, consists, we believe, at first, in contraction of the muscular walls of the stomach itself, the pyloric orifice being usually spasmodically closed; and secondly, the irritation is communicated reflexly to the diaphragm and the muscles of the abdomen, which, by their contraction, powerfully aid the expulsive efforts of the stomach, and its contents are thus more or less violently ejected.

Threatened vomiting can often be prevented by simply diluting the irritating contents of the stomach with water—when there is no actual disease of the stomach present. In those cases certain kinds of food or drink, accidentally taken, remain in the stomach an unusually long time, and provoke a great amount of *acid* fermentation. It would seem as though the pylorus contracted spasmodically so as to prevent the passage into the small intestine of this highly acid or imperfectly-formed chyme; two or three glasses of pure water, or, better still, water containing 10 or 15 grains of sodium bicarbonate in each glass, will entirely remove the tendency to vomit in such cases, and it would seem that when this excessive acidity of the gastric contents is diluted, or neutralised, the pylorus relaxes, and allows the contents of the stomach to pass into the small intestine.

Care in diet will usually suffice to cure this tendency to vomit which is dependent on an abnormal irritability of the stomach to certain ingesta. Iced drinks and effervescing alkaline waters are often of much use in such cases, and in extreme instances complete abstinence from food and repose of the stomach for a short time may be advisable.

In cases of mere gastric irritability the ingesta may be limited to a mixture of milk, ice, and seltzer water for a time; and this should be sucked through a straw or a glass pipette; or an ordinary effervescing mixture, with excess of alkali, may be prescribed.

We have found 20 grains of bromide of sodium dissolved in an ounce and a half of dill-water taken an hour before a meal check or arrest this tendency to irritative vomiting in some neurotic persons. Feeding by the rectum is not very successful in these cases of gastric irritability, as the repeated efforts at vomiting are often attended by involuntary expulsion of the nutrient enemata.

The pathology of these states of temporary or recurring gastric irritability, in the absence of any disease, is somewhat obscure, but they are undoubtedly states of **hyperæsthesia** of the gastric mucous membrane analogous to those forms of cutaneous hyperæsthesia which occur in localised areas of skin in some hysterical persons, and to those cases of irritability of the vesical mucous membrane, with frequent micturition, which we often encounter. But this condition of stomach calls much more urgently for treatment than those other hyperæsthetic states to which we have alluded, for in the latter the nutrition and general health of the patient are not endangered as they are in the former. It is, therefore, not only justifiable, but necessary, to apply anæsthetic remedies freely in those cases until the irritability of the gastric mucous membrane is overcome. It may be necessary to have recourse to opiate and belladonna suppositories or to hypodermic injections of morphine and atropine, or to the internal administration of cocaine, chloroform water, or other sedatives.

Before, however, resorting to these, we should try the effect of more simple measures. Lime water has often a remarkable sedative effect on the gastric mucous membrane, and we should never omit the trial of tablespoonful doses of lime water every hour or two. Cherry-laurel water or hydrocyanic acid is also most useful, and the latter would succeed more frequently than it does were an adequate dose given. In cases of extreme irritability we should begin by giving 3-minim doses of the dilute hydrocyanic acid of the B.P., and increase the dose to 6 or 8 minims, watching carefully ourselves the effect of the remedy. We have known much larger doses than this given, with remarkable success, but such large doses of a poisonous agent must only be given by, or in the continued presence of, a medical man.

Mustard plasters or blisters to the epigastrium or opium plasters have been advocated, and are all worthy of trial in troublesome cases.

Another remedy which will succeed in arresting vomiting in some cases is creasote water, or creasote and lime water—a minim of creasote shaken up with an ounce of lime water; or the creasote may be given in the form of pills made with powdered soap.

Carbolic acid and its derivative, *resorcin*, have also both been warmly advocated as remedies for vomiting, and they act, doubtless, in the same way as creasote. Carbolic acid may be given in 2-grain doses frequently repeated, made into a pill with liquorice powder; and *resorcin* in 5-grain doses, well diluted with water and flavoured with syrup of orange-peel. It is said to be especially useful in sea-sickness.

These remedies all possess strongly-marked anti-parasitic and anti-fermentive properties, and they are also powerful sedatives.

Creasote and carbolic acid have been prescribed in the following forms for this purpose :—

℞ Creasoti	10 minims.
Acid. acetici	20 ,,
Morphinæ sulphatis	1 grain.
Aquæ	ad 1 oz.

M. f. mist. A teaspoonful every half hour for three or four doses.

℞ Acid. carbolici	1 grain.
Chloroformi	4 minims.
Spir. vini rectif.	30 ,,
Aquæ	ad 1 oz.

M. f. mist. Half to be taken immediately and repeated in half an hour.

Many of the remedies we have here indicated are efficacious in checking the symptomatic vomiting of cerebral, renal, and other maladies.

We may now refer especially to two forms of sickness which we shall have no other opportunity of alluding to, namely, sea-sickness and the vomiting of pregnancy.

And first, with regard to **sea-sickness.** We doubt if anything can prevent sea-sickness in certain persons and in certain circumstances, but we are satisfied that much of the distressing nausea and retching which follow the first or second act of vomiting can be, in most persons, effectually relieved, the indication being, *after* the stomach has been evacuated, to allay the hyperæsthesia of the gastric mucous membrane.

It is undoubtedly of great importance to follow a careful and simple diet for a week or two before undertaking a sea voyage, and to take two or three doses of aperient medicine during the same period before embarking.

For voyages of five to ten hours, immunity from sickness may be obtained by taking a sufficient dose of chloral and bromide of ammonium to procure five to ten hours' sleep; 30 grains of each of these in 2 oz. of peppermint water should be taken half an hour before the vessel starts, in which a comfortable sleeping berth should be secured. Certain persons have a tendency to vomit even in taking long railway journeys; bromide of potassium will often prevent this tendency.

In short but stormy passages we have found the following draught very useful, and although ineffectual in preventing the first act of vomiting and the discharge of the contents of the stomach, it has had the effect of taking away much of the distress of this one act of vomiting, and has prevented further nausea and retching. This draught consists of half a grain of hydrochlorate of cocaine and 20 minims of chloroform mixed with an ounce and a half of mucilage and water. It should be given as soon as any serious nausea is felt, and although it will not probably prevent the first act of vomiting, it will, if another dose be taken immediately after this, prevent in many persons a recurrence of the sickness, and remove the distressing continuance of nausea and retching.

There is a considerable amount of evidence in favour of the usefulness of chloral in combating sea-sickness. Dr. Giraldes and Dr. Obet, both quoted by Dujardin-Beaumetz,* bear testimony to its success—the former in his own person in short passages across the English Channel, and the other in his practice as physician to the Transatlantic Company—in doses of 15 to 45 grains—*iced champagne* being given at the same time to allay thirst.

In grave cases, in which the vomiting persists in spite of chloral and other measures, we should not hesitate in the free use of morphine and atropine, injected hypodermically; it is only by such means that the risk of fatal exhaustion can be averted. We should begin with a quarter of a grain of morphine and $\frac{1}{120}$ grain of atropine, and, if necessary, increase the morphine to doses of half, three-quarters, or a whole grain. Iced champagne or brandy and soda water should be given if it can be retained; if not, it is advisable during the continuance of the morphine sleep to administer enemata of milk and brandy or beef-tea and brandy.

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* "Leçons de Clinique Thérapeutique," vol. i. p. 460.

There are, however, a few persons in whom morphine itself excites troublesome vomiting as well as great cardiac depression, and in such cases we must avoid this drug and have recourse to *cocaine* or *chloroform*. One or two drops of the latter on a lump of sugar, or in a wine-glass of iced soda water, may be given every fifteen minutes until relieved; or a solution of hydrochlorate of cocaine in the proportion of 1 grain to the ounce may be given cautiously in doses of one or two teaspoonfuls every hour or two.

A tightly applied abdominal belt has been advocated as a useful preventive to sea-sickness, but it has proved of little efficacy in severe cases.

Bromide of ammonium, which we have already mentioned, is regarded by some ship-surgeons as the best of all remedies, both for prevention and cure. It should be begun a day or two before embarking on a long voyage; a dose of 20 grains in an ounce of chloroform water with 15 grains of sodium bicarbonate twice or three times a day. It will remove acidity and promote gastric anæsthesia.

The application of an ice-bag to the spine has been found useful.

Drop doses of tincture of iodine in a teaspoonful of water every half hour have been given with advantage. Some advocate nitrite of amyl. It may be given in doses of ½ a minim dissolved in 20 drops of spirits of wine, and mixed with a teaspoonful of water every hour.

Oxalate of cerium will occasionally succeed in allaying vomiting after other remedies have failed; 2 to 3 grains should be given mixed with a little powdered sugar every two or three hours. This is, however, usually found of most value in the next form of vomiting to be considered, viz. that dependent upon **utero-gestation.** This is a form of vomiting often excessively troublesome to arrest, and in extreme cases can only be relieved by dilatation of the cervix uteri, or by removing the uterine contents. In some cases a small enema consisting of 20 minims of liquor opii sedativus and 30 grains of bromide of potassium in 2 ounces of water has been found very valuable. The stronger alcoholic liqueurs are often useful in these cases, and small quantities of rum, cognac, Chartreuse or Kirsch may be given, dropped on a lump of sugar from time to time. Large doses of pepsin, 7 to 8 grains, have been advocated as of great service. The late Professor Laségue was a firm believer in the efficacy of tincture of iodine in such cases, given in 5- to 10-drop doses with syrup and water.

Creasote is sometimes very useful in arresting this, as well as other forms of vomiting.

Menthol has also been given with good results. Fifteen grains of menthol are dissolved in five drams of alcohol and an ounce of syrup is added. A teaspoonful of this mixture is given every hour.

Engelmann has found remarkable benefit follow the administration of *cocaine* in obstinate cases of this kind. He has recorded a case in which the exhaustion and emaciation were extreme, and in which he prescribed ten drops of a 10 per cent. solution three times a day. After the first dose water was retained in the stomach, and the following day the patient was able to keep down a cup of coffee, and subsequently some soup. Two days afterwards the dose was diminished, and the treatment was soon discontinued without any return of the vomiting. In this case all the other remedies tried had failed.

Ingluvin has been found by Papp to arrest this form of vomiting. He gave four grains half-an-hour before food, and two tablespoonfuls of a 1 per cent. dilution of hydrochloric acid immediately after food.

Lublesky, of Warsaw, and some other foreign physicians have strongly advised the use of the *ether spray,* applied to the epigastrium by means of a Richardson's pulveriser, for three or four minutes at a time before the patient attempts to take food. Injections of chloral, inhalations of oxygen, feeding by means of the siphon tube, and various other expedients have been advocated for the relief of this troublesome symptom. Sometimes quite simple measures are sufficient to afford relief, *e.g.* a tablespoonful or two of lime water every two or three hours, alone or with an equal quantity of milk; or a simple effervescing mixture, with 3 to 5 minims of dilute hydrocyanic acid in each dose; or 2 or 3 minims of liquor opii sedativus with a few grains of sodium bicarbonate in two tablespoonfuls of hot water half an hour before attempting to take food.

Dr. Ringer advocates minim doses of ipecacuanha wine, with or without small doses of nux vomica, to be given every hour for this and other kinds of vomiting. This should certainly be tried, but we have not found it at all so efficacious as Dr. Ringer has.

Dr. Kenny, of Tallow (*Brit. Med. Journal*, Jan. 2, 1892), has stated that he has found the application of a blister 1½ inch long and half an inch wide over the pneumogastric nerves at the anterior border of the sternomastoid, relieve permanently most distressing vomiting occurring during and after delivery, when the usual drugs had been given without any result.

GASTRALGIA, GASTRODYNIA, SPASM OR CRAMP OF THE STOMACH.

These several designations are applied to certain painful conditions of the stomach referrible to an affection of the gastric nerves—the pneumogastric or the sympathetic—and independent of structural disease or functional alteration of its muscular or mucous structures. Whether dependent on local irritation immediate or remote, or general constitutional states, these conditions must be considered as neuralgic, and their treatment must be guided to some extent by the same principles as determine the treatment of other painful neuroses.

These painful affections of the stomach are often associated with anæmia, chlorosis, and other debilitating influences, and would appear in such cases to be due mainly to an impoverished state of the blood. In hysterical cases, and especially in those connected with organic or functional disorder of the female sexual organs, attacks of gastralgia are exceedingly common, and they are apt then to occur exclusively, or with especial severity, at the menstrual periods. So also in diseases of the abdominal viscera, *gastralgia* may be excited by irritation conveyed along the branches of the sympathetic. It may occur in those morbid states of the blood determined by malaria, by rheumatism, gout, and by other dyscrasiæ.

Attacks of gastralgia may also be of central origin and depend on disease of the gastric nerves at their source, or in their course before they reach the stomach, as from thickening of their sheaths, or from the pressure of tumours upon them, such as aneurisms, etc.

It is obvious that the cause of such attacks must occasionally be obscure, and difficult of discovery. When attacks of gastralgia are induced by certain ingesta which would not cause pain under normal conditions, we must regard the attacks as due, to some extent, to a morbid hyperæsthetic state of the extremities of the gastric nerves.

Gastralgia, like other neuralgias, is apt to occur in any circumstances which lead to general malnutrition, and especially to those which produce exhaustion of the nervous system, so that masturbation and sexual excesses must be included amongst its causes.

The successful *treatment* of gastralgia will depend, in the first place, on one's ability to distinguish it from other morbid states giving rise to pains in the region of the stomach; we must, therefore, consider briefly the characteristic **symptoms** of gastralgia.

The pain in this affection is apt to come on suddenly, and in paroxysms, and then to pass away completely for a time. In some cases the pain is very violent. "Severe griping pains in the pit of the stomach, usually spreading into the back, faintness, shrunken countenance, cold hands and feet, and small intermittent pulse. The epigastrium is either puffed out like a ball, or, as is more frequently the case, retracted, with tension of the abdominal walls. There is often pulsation in the epigastrium. External pressure is well borne (unlike the pain of ulcer and cancer), and not unfrequently the patient presses the pit of the stomach against some firm substance, or compresses it with his hands. . . . The attack lasts from a few minutes to half an hour; then the pain gradually subsides, leaving the patient much exhausted, or else it ceases suddenly with eructations of gas or watery fluid, with vomiting, with gentle perspiration, or with the passage of pale or reddish urine." * There is sometimes a craving for food, and the pain is relieved by taking food—a circumstance which also differentiates this disease from most other morbid states of the stomach. Complete loss of appetite is, however, not uncommon. More or less long intervals between the attacks also serve to distinguish it from the more or less continuous pain of cancer and other affections. When due to malarial causes the attacks may be periodic.

One of the most important considerations is to recognise and distinguish the less severe forms of gastralgia occurring in chlorotic girls from gastric ulcer, which is also so frequently found to exist in such patients. The pain of gastric ulcer is usually aggravated, and not relieved by taking food; and a careful diet or complete abstinence will be attended with the best results. Abstinence will, however, often aggravate the gastralgia of chlorosis. The occurrence of *left-sided* pain is exceedingly common in chlorotic and hysterical girls, and it is sometimes referred to the gastric and sometimes to the cardiac regions, and sometimes more vaguely to the left side in general. It is often very difficult to determine the nature of this pain, in some cases it is doubtless gastralgic, in others it is dependent on neuralgia of the lower intercostal nerves, as may be detected by pressure over the lower interspaces, in others it would seem to be actually *cardialgic*, and dependent on a hypersensitive state of the cardiac muscle, as pressure with the tip of the finger over the cardiac apex is distinctly painful.

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* Romberg.

It is often difficult at first to distinguish between attacks of *biliary colic* and gastralgia, and when there is no jaundice or other signs of biliary obstruction we must be guided chiefly by the history and antecedent and concomitant circumstances of the case.

We have also to bear in mind that gastralgia may co-exist with other diseases, organic or functional, of the stomach, or other abdominal viscera. But having satisfied ourselves of the neurosal character of the disease, the question that has here to be discussed is how it can best be relieved or cured.

When we are able to trace the gastralgic attacks to some obvious cause, the **indications for treatment** are direct and clear. If they are found to occur after taking particular articles of food or drink, these must, of course, be eliminated from the dietary. Tea, coffee, particular kinds of wine, even milk and eggs; certain kinds of raw fruit and vegetables, some varieties of fish or shell-fish will induce in certain persons attacks of gastrodynia. In such persons very careful observation should be made of the effects of different articles of food, and a suitable dietary constructed from which those which disagree with them are excluded.

In chlorotic and anæmic cases our efforts should be directed to restore a normal condition of blood and nutrition. For this purpose ferruginous and other tonics must be given. Some preparations of iron agree much better with these patients than others. Leube* prefers the *lactate of iron*, or the *ferrum redactum* in 3-grain doses, mixed with some aromatic powder, or with extract of cinchona. He also recommends, in such cases, 8 drops of dilute hydrochloric acid in a wineglassful of water two hours after food. We have found the following modification of Blaud's pills very useful :—

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* Ziemssen's "Cyclopædia of the Practice of Medicine," vol. vii. p. 306.

℞ Ferri sulphatis exsic.	3 grains.
Potassii carb.	1 grain.
Pulv. nucis vomicæ	1 ,,
Mucilaginis	q.s.

Ut f. pil. One three times a day an hour after food.

Another combination we have found useful in these cases is the following :—

℞ Ferri et quininæ citratis	10 grains.
Liq. strychninæ	3 minims.
Acid. hydrochlor. dilut.	5 ,,
Aquæ chloroformi	ad 1 oz.

M. f. haust. To be taken two hours after food three times daily.

Dr. Huchard finds the following pills valuable in these cases :—

℞ Ferri tartarati	2½ drams.
Ext. gentianæ	2 ,,
Ext. nucis vomicæ	āā 4 grains.
Ext. opii	

M. To be divided into 100 pills. Two to be taken immediately before each meal.

Ewald prefers an albuminate of iron which he roughly prepares by adding the solution of perchloride of iron to a mixture of egg albumen and water 1 to 5.

The saccharated carbonate of iron is a mild and easily-digested form of iron, and can be given in a powder of 5 to 10 grains after meals three times a day.

Strychnine has been found curative in some instances, from $\frac{1}{80}$ to $\frac{1}{50}$ of a grain may be given hypodermically ; or three minims of the liquor strychninæ in a tablespoonful of chloroform water may be given twice or three times a day, an hour before food.

In anæmic cases, which fail to benefit by the pharmaceutical preparations of iron, it may be advantageous to prescribe a course of iron-water at Spa, Schwalbach, Pyrmont, or St. Moritz.

When masturbation is the cause, Leube advises cold frictions of the whole body and removal to the sea-side for sea-baths, or to St. Moritz for its mountain air and iron-springs.

Cases having a **malarial** origin must be treated with quinine or arsenic. Quinine must be given in adequate doses—5 to 10 grains dissolved in lemon-juice three times a day; if quinine is not well borne or fails to relieve, arsenic should be given—3 or 4 minims of the liquor arsenicalis after meals three times a day. Or it is sometimes better to give a *small* dose of arsenic, one minim of Fowler's solution, in water, immediately before meals, for some considerable time; and this method is applicable to other than malarial cases.

The purely **hysterical** forms are often very difficult to relieve, the bromides alone or in combination with valerian and other antispasmodic drugs should be tried. The *valerianate of zinc* or of iron in grain doses in pills three times a day after food is, perhaps, one of the best remedies in these cases;* or 10 to 15 grains of bromide of sodium or ammonium in an ounce of infusion of valerian with 20 minims of spirit of chloroform, an hour before meals twice or three times a day may be given; or 5 grains of the pil. asafœtidæ comp. thrice daily. Sea-bathing, if it can be borne, is likely to be of more permanent use than drugs in these cases, or the judicious use of cold compresses or douches in a hydropathic establishment, or the application of the constant current; the latter is sometimes very efficacious.

If the attacks are dependent on some uterine affection, appropriate local treatment must be instituted.

When they are associated with the gouty or rheumatic state, the constitutional condition on which they depend must be attacked. The gouty attacks will require very careful dieting and eliminative treatment

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* Ewald recommends also valerianate of caffein.

—the free exhibition of draughts of hot water, or, if there is much acidity, warm Vichy water; if there is constipation, warm Carlsbad water, in addition, taken in the morning fasting.

Hot compresses or mustard poultices to the epigastric region, and warm baths, will be useful in both gouty and rheumatic cases.

In the gouty cases attempts to provoke revulsion to the joints may be made by the use of hot foot-baths of mustard and water or mustard poultices to the feet. It is also advisable to give some diffusible stimulant to relieve the sense of general depression and apprehension which usually accompanies gouty gastralgia, such as the following:—

℞ Ammonii carbonatis	5 grains.
Spiritus ætheris comp.	20 minims.
Aquæ menthæ pip.	1½ oz.

M. f. haust. To be taken every three or four hours until relieved.

Many other remedies have been suggested, such as alum in 15-grain doses three times a day, between meals, potassium iodide, salicin, and sodium salicylate; the last three would certainly merit a trial in rheumatic cases.

Passing now from the fulfilment of the causal indications when these exist, we must consider next the **treatment of the attack** when the cause is unknown or when the immediate relief of suffering becomes the paramount indication.

In most of these cases, opium or morphine in one or other of its forms will be needed. We should endeavour, however, to use as small doses as possible, and to avoid their frequent repetition; for not only is there the fear of inducing a craving for opium or morphine, and the creation of an opium habit, but these drugs have the great disadvantage of arresting the hepatic and intestinal secretions, and, therefore, of causing constipation, loss of appetite, and sluggish digestion, so that the general nutrition becomes greatly impaired by their frequent use. We must not, however, hesitate to use them for the relief of pain when this is severe and when other means fail. The liquor opii sedativus (black drop) is the best form for giving opium in these cases, and it is well to combine it with ammonia and some aromatic, as in the following :—

℞ Liq. opii sedativi...	2 to 4 minims.
Spirit. ammonii aromat. ...	30 ,,
Aquæ carui	1 oz.

To be taken when the pain is severe.

Or we may give a sixth of a grain of the hydrochlorate of morphine hypodermically with $\frac{1}{120}$th of a grain of atropine to relieve the paroxysm.

Cannabis indica has been found most useful in many cases in relieving the paroxysms of pain ; it may be given as follows :—

℞ Tinct. cannabis indicæ	1 dram.
Mucilaginis acaciæ	1 oz.
Aquæ chloroformi	ad 6 ,,

M. f. mist. Two tablespoonfuls for a dose.

In acute gastralgia accompanied with uncontrollable vomiting Stuver has given cocaine and antipyrin combined, with advantage. (*See* formulæ.)

Many French physicians, including Dujardin-Beaumetz, believe that we may avoid the too frequent recourse to opiates in some of these cases by giving chloroform water—a tablespoonful of the aqua chloroformi of the B.P. with some aromatic water—every quarter of an hour. Or a few drops of chloroform on a lump of sugar may be swallowed from time to time. It has the advantage of acting as an antiseptic as well as an anæsthetic, and of checking putrid fermentation in the stomach if any complication of that kind exists. *Cocaine hydrochlorate* may also serve the same purpose as opium if the gastralgia depends on a hyperæsthesia of the peripheral ends of the gastric nerves. Dujardin-Beaumetz gives four-fifths of a grain dissolved in two tablespoonfuls of water, or a third or a half grain in a pill in more chronic forms, three times a day ; and he has by this means relieved the most severe pains of gastralgia.*

In hysterical cases of gastralgia associated with vomiting and spasm, Ewald has found the following drops useful :—

℞	Morphinæ hydrochlor. ...	... 3 grains.
	Cocainæ hydrochlor. ...	... 5 to 8 grains.
	Tinct. belladonnæ... ...	... 1 to 2 drams.
	Emuls. amygdalæ amaræ	ad 1 oz.

Ten to fifteen drops every hour.

Bismuth subnitrate is often found useful in chronic cases. Its action would seem to be entirely local, and it should therefore be given in large doses, such as 30 grains three times a day, together with 3 to 5 minims of dilute hydrocyanic acid and an ounce of mucilage and water. Occasionally purgatives must be given when these large doses of bismuth are used, to avoid the possibility of concretions of this drug forming in the bowels.

Hydrocyanic acid alone will often relieve the pain of gastralgia, but it is a somewhat uncertain remedy, and we probably fear to give it in adequate doses.

Nitrate of silver may also be tried in chronic obstinate cases, a quarter of a grain in a pill with or without half a grain of extract of opium, an hour before taking food twice or thrice daily.

Benefit is sometimes derived from the application of an opium or belladonna plaster to the epigastrium, or from frictions of this region with opium or belladonna liniment ; or a combination of equal parts of opium, belladonna, and chloroform liniments.

Leube strongly advocates the application of the constant current, using from 10 to 15 elements, according to the sensitiveness of the patient. The anode should be placed on the painful point in the epigastrium and the cathode in the left axillary line or nearer the spine, and the application should last from five to ten minutes.

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* "Leçons de Clinique Thérapeutique," vol. i. p. 505. Fifth edition.

ADDITIONAL FORMULÆ.

For hæmatemesis.

℞ Plumbi acetatis, 1 dram.
Acid. acet. dil. 1½ dram
Liq. morphinæ acet., 2½ drs.
Aquæ destill. ad 8 oz.

M. f. mist. A tablespoonful in a little water every two hours. (*Whitla.*)

Mixture for hæmatemesis.

℞ Ol. terebinthinæ, 3 drams.
Extr. digitalis fluid., 1 dram.
Mucilaginis acaciæ, 4 drams.
Aquæ menthæ pip. ad 2 oz.

M. f. mist. A tablespoonful every three hours. (*Bartholow.*)

Resorcin pills for sea-sickness.

℞ Resorcini puri, 1½ to 2 grains.
Sacchari lactis, 2 grains.

M. f. pil. To be taken every two hours. (*H. Menche.*)

Pills for the vomiting of phthisis, of pregnancy, and of gastritis.

℞ Cocainæ hydrochloratis, ⅙ gr.
Opii extracti, ⅙ gr.
Glycerrhizæ pulv., q.s.

M. ut f. pil. To be taken five or six times a day, ten minutes before taking food.

Mixture for the vomiting of pregnancy, and in other forms of vomiting of both peripheral and central origin.

℞ Cocainæ, 2 grains.
Antipyrin, 16 grains.
Aquæ, 3 oz.

M. f. mist. A teaspoonful every half hour or hour. (*Stuver.*)

Mixture for vomiting of pregnancy.

℞ Acid. hydrochlor. dil., 4 drs.
Infus. gentianæ co. ad 8 oz.

M. f. mist. A tablespoonful three times a day in a little water. (*Whitla.*)

Mixture for vomiting of pregnancy.

℞ Acid. hydrocyanici dilut., 1 dram.
Aquæ laurocerasi ad 2 oz.

M. f. mist. A teaspoonful every two to four hours. (*Bartholow.*)

Enema for vomiting of pregnancy.

℞ Sodii bromidi, 30 grs.
Chloral hydrate, 30 grs.
Lactis et aquæ ad 9 oz.

M. f. enema. (*Guéniot*

Mixture for vomiting of pregnancy.

℞ Cocainæ hydrochlor., 6 grs.
Phenacetine, 1½ dram.
Potassii bromidi, 5 drams.
Infus. gentianæ comp. ad 8 oz.

M. f. mist. A tablespoonful three times a day in a little water before meals. (*Whitla.*)

Hypodermic injection for sea-sickness.

℞ Morphinæ hydrochloratis, 4 grains.
Atropinæ sulphatis, ⅛ grain.
Aquæ laurocerasi, ½ oz.

M. f. solut. 15 minims is a dose. (*Dujardin-Beaumetz.*)

For gastralgia.

℞ Aquæ chloroformi (saturated), 5 oz.
Aquæ flor. aurantii ad 10 oz.
Tinct. anisi,* 2½ drams.

M. f. mist. A tablespoonful every quarter of an hour during the attacks. (*Laségue.*)

Solution of cocaine (for gastralgia).

℞ Cocainæ hydrochloratis, 5 grs.
Aquæ, 6 oz.

M. f. mist. Two tablespoonfuls three times a day. (*Dujardin-Beaumetz.*)

Cachets for acid gastralgia.

℞ Bismuthi subnitratis, 2½ drs.
Magnesiæ ponderosæ, 2½ drs.
Cretæ preparatæ, 2½ drs.
Calcis phosphatis, 2½ drs.

M. f. pulv. To be divided into 40 cachets, and one taken before every meal. (*Dujardin-Beaumetz.*)

Treatment of gastralgia.

℞ Morphinæ hydrochlor., 1½ grain.
Aquæ laurocerasi, 75 minims.

M. One drop on sugar directly before each meal.

A natural iron water to be drunk at meals.

℞ Ferri arseniat. 1½ grains.
Extr. valerianæ, 75 grains.
M. et divide in pil. 50.

After a month replace the above drops by one of these pills.

Take an alkaline water with wine at meals.

℞ Potassii bromidi, 160 grains.
Syrup. aurantii ad 8 oz.

M. f. mist. A tablespoonful two hours after dinner.

A cold douche to the whole body for 15 seconds. (*Gallard.*)

For gastralgia associated with mild putrefactive processes.

℞ Chloral hydrate, 80 to 120 grains.
Aquæ ad 5 oz.

M. f. mist. A tablespoonful every two hours. (*Ewald.*)

For gastralgia.

℞ Quininæ sulphatis, 30 grains.
Extracti belladonnæ, 5 grs.
Extracti valerianæ, q.s.

M. et divide in pil. 15. One thrice daily. (*Millet.*)

For gastralgia.

℞ Cocainæ hydrochlor., ⅓ gr.
Chloral hydrate, 10 grains.
Aquæ menthæ pip., 1 oz.

M. f. haust. To be taken occasionally. (*Ewald.*)

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* Made by treating anise-seed, 1 part, with rectified spirit, 5 parts. (*French Codex.*)

CHAPTER VII.

DISEASES OF THE STOMACH—THE TREATMENT OF DYSPEPSIA.

Causes of Atonic Dyspepsia—Defective Relations between Diet and Digestive Capacity—Dyspepsia of Early Infancy—Overfeeding — Drinking at and before Meals—Hasty Feeding. *Symptoms* of Functional Dyspepsia distinguished from those of Gastric Catarrh—Pseudo-anginal Symptoms—State of Bowels and Urine—*Incidental* Nervous Symptoms—"Gastric Cramp," or Paroxysmal Pyrosis. TREATMENT: (1) *Dietetic*—Importance of careful Mastication—Selection and Preparation of Foods—Intervals between Meals—Beverages—(2) *Regiminal*—Exercise and Fresh Air—Change of Air and Travel—Hydrotherapy — (3) *Medicinal* — *Indications* — Vegetable Bitters—Hydrochloric Acid and Pepsin—Strychnia—Alkalies—Soda — Magnesia — Ammonia — Rhubarb — Bismuth — Creasote—Thymol—Charcoal—Lozenges to promote Salivary flow—Hot Water—Value of Purgatives—Mineral Waters—Dinner Pills—Calomel. *Intestinal Dyspepsia*—"Secondary Dyspepsia"—"*Nervous Debility*"—Hydrotherapy — Massage — Electricity — Change of Air—Papain as a Substitute for Pepsin—Note. Additional Formulæ.

THE somewhat vague term **dyspepsia**, when used alone, as the designation of a morbid state, refers generally to a disturbed condition of the digestive functions, the existence of which is independent of any structural or inflammatory change in the stomach itself. There is undoubtedly some force in the remark of Dujardin-Beaumetz that the term dyspepsia ought to disappear from our list of diseases, as it is a symptom or rather a more or less varied collection of symptoms common to different diseases of the stomach.

So also in most serious organic and constitutional affections, such as the specific fevers and acute and chronic visceral inflammations, some amount of dyspepsia, *i.e.* disturbed digestion, is an almost constant symptom; the functions of the digestive organs sharing in the *general* functional disturbance. In such cases the dyspepsia is either simply a part of a general malady, or a sympathetic disorder excited by disease of another organ.

There are, however, some morbid states associated with disturbed digestion, in which it is not always clear whether the dyspepsia stands in the relation of cause or effect to the other co-existing malady ; as, for instance, in such diseases as gout and rheumatism, as well as in some vague affections of the nervous system.

It is difficult, therefore, to treat the subject of so-called "*functional*" dyspepsia with any great precision. To omit it altogether, as Leube does in Ziemssen's "Cyclopædia," or to class it under the gastric neuroses as other writers do, appears to us equally unjustifiable. For there is certainly a *practical* need for its separate consideration, and although many cases which were at one time grouped under the vague heading of dyspepsia, now find their place more appropriately under the more precise designations of acute and chronic gastric catarrh, dilatation of the stomach, and gastralgia, there yet remains a very large group of sufferers from disordered digestion who cannot be so classified, and it is to their condition that the term dyspepsia must be applied, and it is to its treatment that our attention must now be directed.

The search for a **causal indication** for treatment in many of these cases is exceedingly difficult, and in their investigation the skill and practical sagacity and penetration of the physician are often most severely taxed.

It is assumed that in most cases of dyspepsia the gastric juice is altered or defective in quality or quantity, and that an *insufficient* secretion of gastric juice, together with deficiency of muscular action, are the determining conditions of "*atonic*" dyspepsia.

But we have then to consider what are the causes of this defective secretion of gastric juice and this lack of muscular tone in the stomach walls.

No doubt depressing agencies of all kinds may directly or indirectly impoverish or vitiate the gastric secretions, and so induce a dyspeptic state. Exhausting illnesses; over-work, physical and mental; depressing emotions; anxiety and worry; insanitary surroundings and habits, or an unhealthy climate or residence; sedentary occupations; vicious indulgences, indolence, and want of exercise, all these may induce imperfect blood formation, and the anæmic state, and a consequent defective secretion of the digestive ferments. It has been suggested with great probability that in some cases, and especially with Americans, dyspepsia is hereditary. The eager and hasty struggle for wealth, and the inordinate activity and mental excitement dependent thereon, together, probably, with faulty habits of feeding, seem certainly to have made of the modern American a dyspeptic type, the signs of which are seen even in early childhood.

One very certain and common cause of dyspepsia is the neglect to discover and establish a *due relation between the diet or food taken and the natural digestive capacities or peculiarities of the individual.* These natural peculiarities, or idiosyncrasies, are of great importance, and should be carefully inquired into and observed. One person secretes habitually a large quantity of salivary ferment, another a comparatively small amount; or one individual secretes naturally a large quantity of gastric juice, another a comparatively small quantity; so with the bile, as we frequently see, and so, no doubt, with the pancreatic and intestinal ferments. Now it may happen that the persons who secrete a large quantity of gastric juice* may secrete a comparatively small quantity of saliva and of bile; or *vice versâ.* If the individual who secretes a large quantity of gastric juice and a small quantity of salivary ferment and bile eats largely of farinaceous and fatty foods, he will become dyspeptic from inability to digest them; but if he eats largely of animal albuminates and sparingly of starches and fats, his digestion will be good and efficient. On the other hand, if another subject who secretes a minimum of gastric juice and a maximum of saliva and bile, eats largely of animal flesh and but sparingly of carbohydrates and fats, he may become dyspeptic and badly nourished.

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* With regard to the source of the acid in *acid* dyspepsia, Sir William Roberts maintains that it is derived exclusively from excessive secretion or accumulation of gastric juice, and not from any fermentive process. "The sort of windy turmoil," he says, "which goes on in the stomach of the dyspeptic has led observers too hastily to the analogy of vinous fermentation. A more precise examination of the incidents of acid dyspepsia lends no support to this view." ("Digestion and Diet," p. 241.)

That these differences exist cannot be doubted when we note how greatly the amount and character of other secretions, such *e.g.* as that of the skin, differ in different persons. It is our duty, then, to study each individual dyspeptic closely in order to be able to establish an accurate relation (or to correct an inaccurate one) between his diet and his natural individual digestive peculiarities; and the establishment of this relation may be all that is needed to cure his dyspepsia. The food also must be adapted to age and condition. Of the weakened and less active digestive functions of advancing age, less must be required; and strength will be better maintained, in many cases, by diminishing rather than increasing the quantity of food. The *too frequent* taking of solid food and the insufficiency of the intervals between meals is a common cause of disturbed digestion in feeble persons. The frequent occurrence of disorders of digestion in early infancy is to a great extent due to ignorance of, or inattention to, the physiological conditions of the digestive secretions, and the natural digestive capacity at that early age, and nothing less than a careful study of these conditions can enable us to treat these dyspeptic troubles of infant life successfully.

Dujardin-Beaumetz has devoted a whole chapter to the consideration of the "*dyspepsia of the new-born infant*," the greater part of which is occupied with a detailed inquiry into *infant feeding*, which we have fully discussed elsewhere.* The symptoms of dyspepsia at this age are, as he remarks, rather *intestinal* than *gastric*, owing to the briefness of the sojourn at this age of milk in the stomach, and its rapid passage into the intestine. The child is tormented with griping colicky pains after each feeding, the abdomen becomes distended and tender to pressure, exaggerated intestinal peristalsis accompanied with gurglings and rumblings is evident; the stools have lost their natural bright yellow colour and uniform consistence of health; they are grumous, presenting white masses of coagulated undigested casein, and are of a somewhat offensive odour.

The infant becomes cross and irritable, its sleep is disturbed, and it is clamorous to be constantly fed; and each feeding is followed by eructations or vomiting of coagulated milk. If this condition of things is not remedied the child becomes feverish, emaciated, and symptoms of gastro-enteritis appear. The suitable treatment and appropriate remedy for this state is to be found almost solely in an appropriate hygienic diet. The value, however, of antacids and gentle aperients as adjuvants in these cases is undoubted. Lime-water with a little milk, or calcined magnesia, which has the advantage of being aperient as well as antacid, or if there is diarrhœa a few grains of subnitrate of bismuth may be mixed with the magnesia, or a small dose of Gregory's powder, or 15 to 30 minims of castor oil made into an emulsion with a little syrup and mucilage may be given. One or other of these remedies is often useful to remove acidity, to allay irritative diarrhœa, or to sweep away offending substances from the bowels.

But the simple fact of the introduction of too much food into the stomach is responsible for much of the dyspepsia of modern life, and a too great eagerness to follow a so-called "supporting" method of treatment in dealing with anæmic conditions and states of nervous exhaustion has been the cause of this. It should be borne in mind that the digestive powers of the stomach share in the general enfeeblement, and that they need relative rest and a diminution of work in order to restore their tone and vigour.

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* See the chapter on "Food in Relation to Age and Condition" in the author's work on "Food in Health and Disease" (chap. xi.)

The habit, also, of drinking largely *at meals*, while it must interfere with the chemical activity of the gastric juice, also tends to encourage too large a consumption of food. Man is, perhaps, the only animal who drinks and eats at the same time. The desire to continue eating is greatly lessened if no beverage be taken at the same time, and hence the success attending the abstinence from fluids during meals in the treatment of obesity. A certain amount of water is, of course, necessary for the wants of the system; and most articles of food contain a very large proportion of water in their composition, and no physician would object to a good draught of water, preferably hot, half an hour or so before eating, when it dilutes or washes away the residue of the former meal, and refreshes and prepares the stomach for the next.

Haste in eating and imperfect mastication, and insalivation are also fruitful sources of dyspepsia. The food is not sufficiently crushed and subdivided by the teeth, and it is not sufficiently incorporated with the frothy saliva which aërates it, so to speak, and makes it readily permeable by the gastric and intestinal secretions.

These **mechanical** changes in the mouth are, doubtless, of greater importance in digestion than the *chemical* action of the salivary ferment, which can be supplemented lower down by the action of the pancreatic and intestinal juices, but once passed out of the mouth there is no other agency in the whole alimentary canal for mechanically crushing the food.

In the foregoing observations will be found enumerated the chief causes of functional dyspepsia.

Before, however, proceeding to the question of treatment, it will be desirable to enumerate briefly the **symptoms** which are usually found to accompany this form of disordered digestion. They are much the same as those which accompany chronic gastric catarrh, and it is, therefore, not always easy to separate these two affections. But functional dyspepsia occurs more commonly in temporary attacks, recurring more or less frequently, and is induced by slight causes such as a trivial error in diet, some mental worry or over-exertion, physical or mental; or it may be noticed when the patient's health becomes depressed from any cause. It must be remembered, also, that the dyspeptic person is especially likely to become the subject of gastric catarrh, or of gastralgic attacks. Loss of appetite and an uncomfortable sense of weight and fulness after taking food, flatulent distension of the stomach, with acid eructations, "heart-burn," dyspnœa, palpitation and flushing after food, all these symptoms are usually observed. An absence of furring or coating of the tongue, and of any bad odour in the breath are often means of distinguishing atonic dyspepsia from chronic gastric catarrh. Stimulating articles of food, such as spices, pickles, and the like, will often relieve the distress of the atonic dyspeptic, while it will increase that of the catarrhal one. Some dyspeptics complain of pain between the shoulders extending to the left arm, and resembling the pain of angina, and if this is associated with a weak and irregular action of the heart, it may be difficult to distinguish these attacks from true angina. The fact, however, of their occurring *after* food, and not coming on after *physical* exertion, together with the presence of other symptoms of dyspepsia, will generally help us to distinguish between them. Sometimes an examination of the heart will show that it is really feeble and dilated, and in such case treatment must be directed to restore the tone of the heart as well as that of the stomach.

The absence of thirst, of tenderness in the epigastrium, and usually of nausea and vomiting is also relied upon as distinguishing functional dyspepsia from gastric catarrh.

Constipation is a very common and troublesome symptom in these cases, and must never be overlooked in their treatment. The urine may be pale and abundant, but it is also often high-coloured, and deposits lithates on cooling, owing to imperfect intestinal assimilation. Its specific gravity may occasionally be so high as to excite the suspicion of diabetes, but it is usually due to an increase in the ordinary urinary solids. It is often much darkened by boiling and nitric acid, assuming various shades of the well-known mahogany hue. In the neurotic it will often deposit an excess of phosphates; at other times crystals of oxalate of lime may be detected in its deposit on microscopic examination.

Various occasional and incidental symptoms are associated with attacks of dyspepsia. Some of these are probably caused by the non-elimination and the absorption into the blood of toxic substances occasionally produced during stomach or intestinal digestion; or these substances may be produced normally during one part of the assimilative process and destroyed in another, later part; and the failure of this later act in the assimilative process may be the cause of some of the symptoms observed.

Giddiness is one of the most alarming of these symptoms, and is probably caused by some sudden vaso-motor disturbance. More protracted nervous affections in the form of migraine headaches, ocular migraine, hemiopia, and other visual disturbances are not rare.

Languor, drowsiness, depression of spirits, or irritability of temper, and sleeplessness are also frequent.

The occurrence of "*gastric cramp or paroxysmal pyrosis*" as an occasional symptom in the course of acid dyspepsia has been mentioned by Sir William Roberts* as a "peculiar and characteristic symptom." It consists in a sudden attack of cramp of the stomach with sudden profuse salivation, lasting half a minute to a minute. He suggests that the term "pyrosis" should be confined to these paroxysms. There is but little sense of nausea during these attacks, and they rarely culminate in actual vomiting. The saliva gushes from the mouth in great abundance, and it is unusually alkaline. The paroxysm only occurs when there is surplus acid in the stomach, and the relief which follows the paroxysm is due to the large quantity of alkali conveyed to the stomach in the saliva swallowed. These paroxysms of pyrosis may occur once a day, or once in two or three days, sometimes only once a week, once a month, or once a year.

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* "Digestion and Diet," p. 247.

The **treatment** of functional dyspepsia may be considered under three headings—(1) dietetic, (2) regiminal, and (3) medicinal.

(1) **Dietetic treatment.**—We have already called attention to the part played in the causation of dyspepsia by imperfect mastication and insalivation. This must be strictly inquired into and remedied. Defective teeth should be seen to, and when this defect cannot be rectified, food should be given which needs but little mastication : the crumb of stale bread, thin dry toast, and some kinds of biscuit readily disintegrate in the mouth, whereas *new* bread forms tough coherent masses there.

Vegetables should be reduced to the form of "*purées*," potatoes especially should be *mashed* fine, and *new* potatoes which are "waxy" should be prohibited. All fats should be finely divided and mixed with other foods, and not eaten in lumps. If, owing to defective teeth or tenderness of the gums, mastication is painful, lean of meat should be pounded or reduced to pulp. The American mincer may be used for this purpose.

The shorter-fibred meats are the best for dyspeptics, as they are more easily disintegrated. The quality of the meat should be looked to—different qualities of mutton, beef, or fowl will differ greatly in their digestibility. White-fleshed game is more digestible than the dark kinds; the delicate sole, whiting or flounder than the firmer and richer fleshed mullet, salmon, etc. Foods saturated with butter or fats must be avoided; they are almost impenetrable to the gastric juice. Sweetened dishes are also to be avoided as prone to excite acid fermentation, and all unripe fruits, nuts, and the cellulose coverings of vegetables, as difficult of digestion. It is hardly necessary to insist that the preparation and cooking of the food should be good and savoury. Sauces and melted butter should not be taken: with fish, plain butter if required, and a little lemon juice may be used. The bread should be carefully selected, as some kinds of bread are apt of themselves to cause dyspepsia; and too large a quantity of imperfectly-masticated bread is a common source of disordered digestion. A good bread should be porous, crumble easily, and not mass together in the mouth in mastication. Some kinds of *wholemeal* bread, although very nutritious and pleasant to eat, are difficult of digestion, and will certainly aggravate the dyspepsia of some persons.

The **meals** of a dyspeptic should be small or very moderate in quantity, and our object should be *to select a diet which, while it affords the necessary amount of nourishment to the body, imposes the smallest amount of labour on the stomach.* These small meals should be eaten slowly, and a sufficient time allowed to elapse between them to insure the complete digestion of one meal before the next is taken. *Solid* food takes from five to eight hours to digest,* according to its nature and quantity, and in old age and in persons of feeble digestion it may take longer. *This is one of the facts of feeble digestion most difficult to get accepted not only by the patient but often also by the doctor!*

Persons with no occupation are very apt to take food too frequently, and to suffer in consequence from dyspepsia.

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* The estimates published in books on the physiology of digestion, of the periods of time required for the digestion of different articles of diet in the stomach, will be found, when tested by practice, especially amongst the dyspeptic and persons of middle and advanced life, to be far too brief.

The dyspeptic should rest for a short time before a meal, and for a longer time after one. Abuse of alcohol and tobacco, of tea and coffee, should be interdicted. In some cases of atonic dyspepsia a small quantity of sound wine or spirit with water, taken just before or after a meal, seems to serve as a useful stimulus to gastric secretion; the same purpose will be better served in many by 4 or 5 tablespoonfuls of hot, clear soup at the beginning of the repast.

The use of tea and coffee requires discrimination. When the dyspepsia is associated with irritability of the nervous system it is best to avoid both altogether. In other cases it is advisable not to take them with or soon after food—they then often retard digestion; but taken three or four hours after a meal, and taken alone, and not too strong, they appear to promote, in some persons, the final stage of stomach digestion. A cup of hot water, slowly sipped, and taken instead of tea or coffee three or four hours after a meal proves very useful to most dyspeptics.

In anæmic cases a moderately stimulating diet is best—agreeably-flavoured animal food and soups are more easily digested than farinaceous ones, which have a tendency to undergo acid fermentation in those with feeble digestions.

Individual peculiarities, as we have already said, must be carefully studied, as they may depend on physiological variations of function.

Uncooked and green vegetables must be avoided, as they are very prone to give rise to flatulence.*

(2) The **regime**, or mode of life of the dyspeptic, requires careful attention. Sedentary habits must be given up, and free exercise in the open air insisted upon. Removal from the town to the country, or to the sea-side (with sea-bathing), or a tour in Scotland or amongst the Swiss Alps, will be found

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* Further details as to diet in indigestion will be found in the author's work on "Food in Health and Disease," p. 385.

sufficient to cure many troublesome cases of dyspepsia. When this is not convenient, a course of hydrotherapy in a well-organised hydropathic establishment, where at the same time the food habits are carefully attended to, will often be of great service.

More confirmed cases, especially when complicated with hypochondriacal symptoms, may require a more prolonged period of travel and frequent change from place to place.

(3) **Medicinal treatment** also will be needed in most cases;* (*a*) *to promote the functional activity of the muscular coat and secreting glands of the stomach.*

For this purpose the vegetable bitters, quassia, gentian, calumba, nux vomica, chirata, hydrastis canadensis, bitter orange-peel, hop, etc., combined with an alkali—if there is excess of acidity with sour eructations; or with a mineral acid if there is reason to suspect a deficiency in the acid of the gastric juice—are of undoubted value in promoting the activity of the digestive functions and exciting appetite. It is difficult to explain how these vegetable bitters act, but from recent observations it would appear that, given a short time before a meal, they promote the secretion of free hydrochloric acid, and in cases where there is a tendency to deficiency of this acid in the gastric juice, they prove efficacious gastric tonics.

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* Sir William Roberts ("Digestion and Diet") divides dyspepsia into an *atonic* form and an *irritative* or *acid* form. In the first there is deficiency of gastric juice and of muscular action in the stomach; in the second there is an undue secretion or accumulation of acid in the stomach, especially towards the later stages of digestion. We recognise the practical value of this division in our indications for medicinal treatment. It corresponds with the division of French authors into *hypochlorhydric* and *hyperchlorhydric* dyspepsias. Bardet ("Nouveaux Remèdes," November 22, 1892) insists on the value of a vegetarian dietary in the latter form, and of long intervals (not less than seven hours) between meals. He also prescribes intestinal antiseptics, of which he prefers benzonaphthol or salicylate of bismuth combined with hydrated magnesia. In a subsequent discussion at the Société de Thérapeutique, Huchard contested the propriety of a vegetarian diet, and advocated very large doses of sodium bicarbonate as absolutely curative in certain forms.

Either of those mentioned may be used, but the combination of calumba or gentian with nux vomica has appeared to us a most useful one. In cases where there are acid eructations, or even without these, the addition of sodium bicarbonate is most useful, its effect in promoting the secretion of the gastric glands when given on an empty stomach being generally admitted. We are in the habit of prescribing the following draught as one of the best medicinal remedies for atonic dyspepsia when taken half an hour or an hour before meals :—

℞ Sodii bicarbonatis	15 grains.
Tinct. nucis vomicæ	15 minims.
Tinct. calumbæ	$\frac{1}{2}$ dram.
Spir. ammoniæ aromat.	$\frac{1}{2}$,,
Infusi aurantii comp. ...	ad 1 oz.

M. f. haust. To be taken three times daily, half an hour or an hour before food.

If, on the other hand, we find there is great slowness and torpor of digestion probably from insufficient acidity of the gastric juice, we may give the above mixture, leaving out the soda and ammonia, and adding 10 minims of dilute hydrochloric acid, with or without 3 or 4 grains of *pepsin*, and 3 minims of tincture of capsicum, immediately or soon after meals thrice daily. It is better sometimes to give the pepsin during or at the commencement of a meal, and the acid bitter mixture an hour or two afterwards.

When there is great muscular debility and nervous exhaustion associated with the dyspepsia, 5 minims of the liquor strychninæ may be given instead of the nux vomica with each dose of the acid mixture.

(*b*) *To relieve acid eructations and flatulent distension.**

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* The remarkable fact that, in cases of acid dyspepsia, the ingestion of a meal will sometimes relieve the dyspepsia, is thus explained by Sir William Roberts: "The acid residuum is not entirely got rid of when the next meal arrives; in this case the sour mucus for a short space of time floats on the surface of the new meal, and the eructations are consequently acid; but presently

One of the most annoying troubles of dyspeptic patients is attacks of flatulence with sour eructations and "heart-burn." Some warm stomachic and alkaline mixture should be given the patient for occasional use when these occur, which they often do, two or three hours after a meal. Fifteen to 30 grains of bicarbonate of soda in half a teacupful of hot water will often suffice. The following compound of rhubarb, soda, ammonia, and magnesia is very efficacious :—

℞	Tinct. rhei	1 dram.
	Sodii bicarb.	15 grains.
	Magnesii carb.	10 ,,
	Spir. ammoniæ aromat.	½ dram.
	Aquæ carui ... ... ad	1 oz.

M. f. haust. To be taken occasionally.

Some patients object to the taste of rhubarb, and in that case the compound tincture of cardamoms may be substituted for the rhubarb in the above draught. Bismuth or Vichy lozenges are useful expedients for this purpose, and are largely used. The *soda-mint* tablets are also good.

When the flatulent distension of the stomach is a very troublesome symptom, a pill containing *creasote* or *thymol* given immediately after food is often very efficacious in arresting it.

Creasote may be given in capsules, each containing 1 minim, and thymol in grain doses also in the same manner. Creasote, however, will prove irritating to some patients if given pure in capsules, and it is better to give it made into a pill (and thymol also) with powdered soap.

℞ Thymol, 1 grain (or creasote, ½ minim).
Pulv. saponis, q.s.†
Ut f. pil. To be taken after food thrice daily.

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it mingles with the meal, and the degree of acidity of the total gastric contents is thereby reduced by dilution, and the eructations cease to be sour." Such persons "are cured, much to their surprise, by taking a full meal, the fact being that the new meal gives the surplus acid work to do and so ends the attack." ("Digestion and Diet," p. 238.)

† A little spirit may be needed to make the thymol and soap

Bismuth will also be found very useful in relieving cases of acid, flatulent dyspepsia, and it seems to have a tonic effect resembling that of iron in some of these cases. We are accustomed to prescribe the following mixture :—

℞	Liq. bismuthi citratis	1 dram.
	Sodii bicarb.	10 grains.
	Spir. chloroformi	20 minims.
	Infusi calumbæ ... ... ad	1 oz.

M. f. haust. To be taken an hour before food three times a day.

Some cases of acidity, especially those due to butyric or acetic fermentation, seem to be more amenable to treatment with dilute hydrochloric acid. It should be given in small doses, 10 to 15 minims, with some light bitter infusion just before food. It acts as an antifermentive.

Charcoal is a favourite remedy for gastric flatulence, but we have not found it so efficacious as the above bismuth mixture. It is sometimes given in combination with bismuth—5 to 10 grains of powdered wood charcoal with 5 grains of bismuth. This powder may be taken in a cachet immediately before, or soon after a meal, according to the period when the flatulence is most complained of. Sir William Roberts has suggested the sucking of gum lozenges to promote the natural flow of saliva, and so diminish the acidity of the stomach's contents by neutralising it with alkaline saliva.

A very simple and efficacious remedy for some forms of *acid* dyspepsia, those forms especially which are so common, of an excessive formation of acid towards the end of stomach digestion, is the administration of a draught of hot water three or four

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into a pill. The following has been given as a good formula for making creasote into pills :—

Creasote	15 grains.
Powdered liquorice root (not decorticated) ...	30 grains.

Set aside for a few minutes and then add 3 drops of distilled water. Rub them together and divide the mass into the number of pills desired.

hours after a meal. This dilutes the acid contents of the stomach, and the discomfort or even pain caused by the excessive acidity is at once relieved. If, however, the amount of acid is very great it is advisable to add a few grains of magnesia or of sodium bicarbonate to the hot water.

Dr. Huchard has given very large doses of the *sodium bicarbonate* with remarkable success for the relief of severe paroxysms of gastric pain arising from hypersecretion of hydrochloric acid. In a case in which extremely severe pains, with pyrosis, occurred at 11 a.m., 3 p.m., and at midnight, and lasted an hour or more each time, after trying various modes of treatment without any good result, he at length gave frequent large doses of sodium bicarbonate with complete success. In these cases it would appear that there is a continuous secretion of hydrochloric acid, *not* limited to the periods of digestion, but occurring also during the intervals; that the contact of this acid with the surface of the empty stomach induces a loss of power in the muscular walls, while the excess of acid during digestion arrests the conversion of starchy foods into sugar, and these ferment in the stomach, and this fermentation together with the loss of tone in the muscular wall starts a tendency to *dilatation.* At the same time there is also a great tendency to the occurrence of ulceration of the mucous membrane from quite slight causes, as *e.g.* a blow on the epigastrium.

An adequate *alkaline* treatment is, therefore, urgently indicated. The patient referred to was given 6½ drams of sodium bicarbonate in twenty-four hours in repeated doses of 15 grains, together with an alkaline water at his meals, and milk mixed with lime water. The next day the patient was greatly relieved, and the improvement increased from day to day. Some prepared chalk was added to the sodium bicarbonate, as the latter is too soluble, and its neutralising action is, therefore, too soon exhausted. The insoluble lime salt acts more slowly, and is dissolved only in proportion to the acid secreted. For the accompanying constipation the patient had also two large spoonfuls of calcined magnesia daily. The patient was cured. Dr. Huchard refers with justice to the "*ridiculous fear* of an alkaline cachexia" which prevents many practitioners from giving adequate doses of sodium bicarbonate in cases like this.

(*c*) *To promote complete elimination of the bye-products of a sluggish and disordered digestion, and to remove noxious accumulations in the intestinal canal.*

The paramount importance of relieving the constipation that accompanies most cases of atonic dyspepsia is evident. It is, perhaps, in many cases the original evil. The retention of noxious bye-products of digestion in the intestinal canal and their absorption into the blood is probably the cause of many of the *general* symptoms present in chronic dyspepsia, *e.g.* the headaches, the giddiness, the languor and drowsiness, the mental depression, and the hypochondriasis;* while the tendency to abdominal venous stasis which must necessarily be associated with an inactive state of the intestinal walls, naturally leads to an impairment of the secreting functions of the glands of the stomach and intestine.

It is in responding very thoroughly to this indication that courses of mineral waters prove so valuable to dyspeptic patients. We must here remark on the widespread existence of a very remarkable error in the minds of English medical practitioners, even of large general experience, as to the effects of a course of active mineral waters in cases of atonic functional dyspepsia. No more brilliant results are obtained in medicine than from the application of such course of waters as may be obtained at Carlsbad, Marienbad, Kissingen, Tarasp, or Brides les Bains in cases of dyspepsia with habitual constipation. We have found that medical men often tell their patients that such courses are "too lowering;" but they are, on the contrary, health-restoring, and, therefore, *tonic* in the best and truest sense. They frequently prove tonic and restorative after all the so-called tonics, such as iron, quinine, strychnine, arsenic, etc., have utterly failed; and they do so by washing the intestine clean, by removing toxic accumulations, by promoting the abdominal circulation, by stimulating the secretion of the liver and all the peptic glands, and, in short, by promoting due elimination; and these excellent medicinal effects are associated with the hygienic influences of a suitable well-regulated diet, and a life largely spent in the open air.

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* Sir William Roberts appears to think that there is no reason to believe this depression to be due to the absorption of toxic substances: "The pain and physical discomfort in the epigastrium appear to me quite sufficient to account for this depression without invoking the aid of any poisonous alkaloid formed during the digestive process. There is a peculiar bitter principle, produced during both the gastric and pancreatic digestion of proteids, but this is a normal product, and there is not the least evidence that it possesses poisonous properties." ("Digestion and Diet," p. 243.) Whatever may be the nature of the substances carried away by a purgative, there can be no question as to the relief to the depression it affords. Lord Byron wrote: "The thing that gives me the highest spirits (it seems absurd, but true) is a dose of salts; but one can't take them like champagne!"

For cases of chronic atonic dyspepsia, dependent on defective gastric secretion, and muscular want of tone, the waters of Kissingen, Homburg, or Brides les Bains are most suitable. The Ragoczy spring at Kissingen is especially renowned for its curative influence in cases of atonic dyspepsia. In cases of irritative dyspepsia of a gouty nature, or in plethoric persons, the warm alkaline-sulphatic springs of Carlsbad are especially valuable. When the dyspepsia is associated with loss of nervous tone, and a more bracing influence is needed, the higher elevation of Marienbad and Tarasp is particularly suitable. In cases where there is much gastric irritability, and a tendency rather to diarrhœa than constipation, the waters of Vichy or Neuenahr are more applicable.

It is quite practicable, if patients will submit to a strict régime of diet and exercise, and reside in a healthy, open situation during the treatment, to follow a course of these waters in England. We have repeatedly prescribed and directed such courses with excellent results. The waters of Leamington and Harrogate are also suitable to some of these cases.

But other means may be adopted, and, indeed, are required to relieve the constipation, and these will answer better with some persons than mineral waters. One of the best of these is a pill of a grain or two of extract of aloes, $\frac{1}{2}$ or $\frac{3}{4}$ of a grain of powdered ipecacuanha, and a grain of soap, taken half an hour before the principal meal of the day. If the aperient effect of this pill is not sufficient, it can be supplemented by taking next morning, fasting, in a tumblerful of hot water, this powder :—

℞ Sodii sulphatis	1 dram.
Sodii bicarb.	15 grains.
Sodii chloridi	10 ,,

M. f. pulv.

On the other hand, there are cases which are very sensitive to the action of aperients. They require aperients, but they must be mild ones. With such patients the following pill serves not only as a gentle aperient, but also as an excellent stomachic, and stimulates gastric secretion : —

℞ Ipecacuanhæ pulv.	$\frac{1}{2}$ to $\frac{3}{4}$ grain.
Rhoi extracti	2 or 3 ,,
Nucis vomicæ extract.	1 ,,

M. f. pil. To be taken half an hour before food twice or three times a day.

In other cases no remedy seems so useful as small doses of calomel. Dr. William Carter, of Liverpool, has advocated strongly the use of this remedy in certain forms of dyspepsia, its remedial action being greatly due, he believes, to its efficacy as an intestinal antiseptic, and its powerful destructive influence on anaërobic bacilli.*

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* "Illustrations of the Operation of Ferments in Disease." Edinburgh, Neill and Co. 1889.

Dr. Carter also testifies strongly to the value of calomel in controlling the abnormal gastric and intestinal fermentations in children. He prescribes $\frac{1}{20}$ grain of calomel with 1 grain of boric acid with the child's food three times a day. In proof of the remarkable action of calomel as an intestinal antiseptic, Dr. Carter has found that the addition of calomel to bile will keep it sweet for an indefinite time, and, what is far more remarkable, if added to a mixture of meat and pancreas, which is prone to rapid decomposition, and the development of the very foul-smelling *indol*, no change of the kind takes place.

These interesting observations of Dr. Carter lead us to the consideration of what has been termed **intestinal dyspepsia.** Under this designation a variety of conditions has been described, dependent, some on functional or organic disease of the liver and pancreas, some on acute or chronic intestinal catarrh, and some forming really a part of the phenomena of gastric indigestion. The latter only concern us now, as the others will be treated of under their appropriate designations.

The normal course of intestinal digestion will necessarily be disturbed when the results of stomach digestion are abnormal, and the food is passed on from the stomach to the small intestine in an imperfectly prepared state. This may arise simply from over-feeding or from admitting into the stomach food that cannot be digested there. The dyspepsia of infants is often of this character. It may occasionally happen, but this is probably very rare, that there exists what has been termed an "incontinence of the pylorus," which relaxes too soon, and allows of a premature passage of the food from the stomach into the duodenum. It might thus happen that more undigested food found its way into the small intestine than could be digested there, and intestinal colic, flatulence, and diarrhœa might thus be set up. So, also, in cases of acid dyspepsia, the chyme passing into the small intestine may be so excessively acid as to destroy or greatly weaken the digestive powers of the alkaline bile and pancreatic juice, and so symptoms of intestinal indigestion would be aroused. Duodenal catarrh and catarrhal jaundice may also thus be occasioned.

But the treatment appropriate to these states is obviously that adapted to the amelioration of the disturbed gastric functions upon which they are dependent.

The treatment of so-called **secondary dyspepsia,** associated with cardiac and hepatic disease, with chlorosis, scrofula, tuberculosis, gout, rheumatism, and organic nervous affections, will be dealt with when we come to consider the treatment of these morbid states.

We may, however, discuss briefly the treatment best suited to those not uncommon forms of dyspepsia which are associated with what is termed **"nervous debility,"** and which are often induced by worry and anxiety. Many of the symptoms complained of must be dealt with on the general principles already laid down, but we must not overlook the necessity of applying at the same time restorative treatment to the exhausted or irritable nervous system. Such cases are often marvellously benefited by a course of hydrotherapy associated with *massage*,* or with the application of the continuous galvanic current; change of climate, especially to mountain air (the sea-side often disagrees with such patients), and abundance of out-of-door exercise are also of great value.

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* *Massage* is very useful in some cases of atonic dyspepsia. It should be applied in the following manner : The patient, two or three hours after a full meal, should be placed on his back with the head and shoulders raised, the thighs flexed on the pelvis, the mouth a little open, and free respiration encouraged. The physician should begin by tapping or stroking gently and superficially over the region of the stomach ; during these manipulations he should gradually increase the amount of pressure employed, till, after a longer or shorter time, according to the sensitiveness of the patient, he is able to thoroughly knead the stomach. All these manipulations, which should not last longer than about ten minutes, should be made in the same direction, *i.e.* from the cardiac end and the greater curvature towards the pylorus. The effect of this massage is to accelerate the passage of the food into the duodenum and to prevent its too prolonged stay in the stomach, and also to evacuate the stomach of any lingering imperfectly digested substances remaining from a previous meal. It further rouses the contractility of the muscular coat of the stomach, and

Some *nervine* medicines are also of use. In cases of nervous *exhaustion*, chiefly, a pill of a grain and a half or 2 grains of *valerianate of quinine* with half a grain of *extract of nux vomica*, an hour before meals three times a day, will be found valuable; but in cases of *irritability* of the nervous system it will sometimes be found better to give 10 or 15 grains of *bromide of sodium*, with half a dram of *tincture of serpentary* in an ounce of caraway water half an hour before lunch and dinner.

As the gastric juice secreted by these patients is often defective in quality or deficient in quantity, or both, it is often advisable to supplement this by the administration immediately after food of a digestive ferment such as a dram of Benger's liquor pepticus or 4 or 5 grains of good pepsin, with 5 to 10 minims of dilute hydrochloric acid, 3 minims of liquor strychninæ, and 3 minims of tincture of capsicum, in an ounce of compound infusion of bitter orange-peel.

Recently *papain* has been advocated as a more reliable and more certain digestive ferment than pepsin; we have not, however, been able to satisfy ourselves that it is so. It is the active principle of the Carica papaya, or South American melon tree. The papain extracted by Prof. Finckler's process is considered to be the best. It is said to have the advantage over other digestive ferments of acting

increases the secretion of gastric juice. *Massage of the stomach* should be followed by massage of the intestines for about four or five minutes, to overcome co-existing constipation; the manipulation should of course follow the large intestine from cæcum to sigmoid flexure. The following results have been observed to follow this treatment: A sense of relief and comfort immediately after the *séance*, the disappearance of the distressing feeling of weight and heaviness so common during the digestive process with these patients. A desire to sleep is often experienced, and the hypochondriasis from which dyspeptics so often suffer is greatly relieved.

either in an acid, alkaline, or neutral medium. It is also stated to be antiseptic in its action, and to exert a local tonic and sedative effect on the stomach.

The dose of papain Finckler is 2 to 5 grains dissolved in half a wineglass of water after meals.

NOTE.—In recent years, especially in Germany, methods of investigating disorders of gastric digestion by the chemical examination of the contents of the stomach, withdrawn from that organ by means of a stomach tube, usually at a fixed period after a test meal, have been largely practised. An elaborate account of these methods will be found in the first two chapters of the second volume of Ewald's "Lectures on Diseases of the Stomach." How complex, difficult, and inconclusive some of these methods are, no careful reader of these chapters can fail to realise. Ewald himself remarks that he is "far removed from a one-sided over-estimation of their value," and we are inclined to believe that with further experience of these methods it will be found that the information they yield is often of no more precise practical value than is obtainable by other clinical methods less troublesome, and in some senses, less objectionable. Many of these methods, in order to arrive at absolutely certain conclusions, involve an amount of laborious and delicate chemical testing which it would be absolutely impossible to apply in the ordinary course of medical practice. As investigations in physiological and pathological chemistry they are of great value, but as we have already said, we much doubt if they will take a permanent place in the methods of clinical medicine. They may be occasionally useful to corroborate, or otherwise, conclusions arrived at by the ordinary methods of clinical investigation. Those who desire to become fully acquainted with these new methods of investigating stomach diseases, will find them fully described in Ewald's work mentioned above, or in Dr. D. D. Stewart's article on Diseases of the Stomach, in Hare's "System of Practical Therapeutics."

ADDITIONAL FORMULÆ.

To promote appetite (in atonic dyspepsia).

℞ Tinct. cascarillæ, 2½ drams.
Tinct. rhei, 5 drams.
Tinct. nucis vomicæ, 2½ drs.
Tinct. gentianæ, 10 drams.
Tinct. aurantii ad 4 oz.

M. f. tinctura. Two teaspoonfuls, in water, a short time before a meal. (*Huchard.*)

Another.

℞ Tinct. nucis vomicæ, 30 mins.
Tincturæ gentianæ, 2½ drams.
Tincturæ aurantii, 2½ drams.
Tincturæ anisi, 2½ drams.*
Tincturæ cardamomi comp., 1 dram.
Aquæ menthæ pip., 2 oz.
Aquæ ad 8 oz.

M. f. mist. One tablespoonful ten minutes before each meal. (*H. Huchard.*)

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* French Codex.

To promote appetite in dyspepsia.

℞ Ammonii carb., 1 dram.
Potassii bicarb., 1½ dram.
Infusi chiratæ ad 6 oz.

M. f. mist. A tablespoonful three times a day. (*Charteris.*)

In atonic dyspepsia.

℞ Ext. nucis vomicæ, 4 grains.
Ext. quassiæ, 20 grains.
Quininæ sulph., 40 grains.

M. et divide in pil. 20. One three times a day after meals. (*Hare.*)

Or

℞ Ext. chiratæ, 40 grains.
Extr. gentianæ, 40 grains.
Oleo-resin capsici, 5 minims.

M. et divide in pil. 20. One after each meal. (*Hare.*)

Powder for atonic dyspepsia.

℞ Sodii bicarb. exsiccat., 5 grs.
Magnesii carb., 10 grains.
Pulv. rhei, 6 grains.

M. f. pulv. To be taken before meals three times a day.

Or

℞ Sodii bicarb. exsiccat., 1 oz.
Pulv. rhei, 6 drams.
Pulv. calumbæ, 1 oz.
Pulv. zingiberis, 4 drams.
Pulv. doveri, 35 grains.
Quininæ sulphatis, 25 grains.

M. f. pulv. An eggspoonful in a little water.

Chloroform mixture for flatulent dyspepsia.

℞ Tincturæ anisi,* 2 drams.
Aquæ flor. aurantii, 4 oz.
Aquæ chloroformi (saturatæ) ad 8 oz.

M. f. mist. A dessertspoonful to be taken before or during a meal.

Or

Drops for the same.

℞ Chloroformi, 40 to 80 mins.
Tincturæ anisi, 2 drs.
Tincturæ nucis vom., 2 drs.
Tincturæ gentianæ, 2 drs.

M. Take ten to twenty drops in a little water, at least a quarter of an hour before a meal. (*H. Huchard.*)

For chronic dyspepsia with deficient gastric secretion.

℞ Acidi nitro-hydrochlor. dil., 6 drams.
Liquoris strychninæ, 1½ dram.
Tincturæ aurantii, 1 oz.
Tincturæ calumbæ, 1 oz.
Infusi gentianæ ad 10 oz.

M. f. mist. A tablespoonful in a wineglassful of water three times a day after food.

Resorcin mixture for acute gastritis and dyspepsia.

℞ Resorcini (*pure white, bisublimated*), ½ dram.
Acid. hydrochlor. pur., ½ dram.
Syrupi aurantii, 5 drams.
Aquæ destill. ad 6 oz.

M. f. mist. One tablespoonful every two hours. (*H. Menche.*)

For dyspepsia in infants born before term.

℞ Pepsinæ glycer., 2½ drams.
Acid. hydrochlor. dil., 10 minims.
Aquæ ad 3 oz.

M. f. mist. A teaspoonful ten minutes after each meal. (*Prof. Monti, Vienna.*)

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* French Codex.

Alkaline powders for acid dyspepsia.

℞ Bismuthi subnitratis, 2½ drs.
Magnesiæ ponderosæ, 2½ drs.
Sodii bicarbonatis, 2½ drs.

M. Divide into 30 powders, one to be taken before meals. (*Dujardin-Beaumetz.*)

Absorbent powders for flatulent dyspepsia.

℞ Pulv. carbonis ligni, 2 drs.
Sodii bicarbonatis, 1½ dram.
Magnesiæ ponderosæ, 1 dr.
Pulv. calumbæ, ½ dram.

M. et divide in pulv. (or cachets) 40. One to be taken half an hour or an hour before a meal. (*H. Huchard.*)

Antiseptic powders for flatulent dyspepsia.

℞ β-Naphthol, 1½ dram.
Bismuthi salicylatis, 1½ drm.
Magnesiæ pond., 1½ dram.

M. et divide in pulv. (or cachets) 36. One half an hour or an hour before meals. (*H. Huchard.*)

For flatulent dyspepsia.

℞ Magnesiæ } āā partes equales.
Calcii phosphatis
Carbonis ligni pulv.
Sulphuris sublim.

M. f. pulv. A teaspoonful in water when necessary. (*P. Chéron.*)

For acid dyspepsia with pyrosis.

℞ Magnesiæ, 2 grains.
Bismuthi subnit., 5 grains.
Pulv. opii, ½ grain.

M. f. pulv. To be taken before eating. (*Piorry.*)

As a digestive in flatulent dyspepsia.

℞ Pancreatinæ, 1 dram.
Sodii bicarbonatis, 1 dram.
Magnesiæ pond., 1 dram.
Nucis vom. pulv., 6 grains.

M. et divide in pulv. (or cachets) 20. One at the beginning of each meal. (*H. Huchard.*)

For flatulent dyspepsia.

℞ Tinct. cardamomi comp., 4 drams.
Tinct. zingiberis, 3 drams.
Spir. ammon. arom., 2 drams.
Spirit. chloroformi, 2 drams.
Acid. hydrocyanici dilut., 40 minims.
Aquæ carui ad 6 oz.

M. f. mist. A tablespoonful occasionally. (*Charteris.*)

For obstinate flatulence with pyrosis.

℞ Argenti nitratis, 4 grains.
Extr. nucis vom., 3 grains.
Extr. lupuli, 24 grains.

M. et divide in pil. 12. One thrice a day. (*Barlow.*)

CHAPTER VIII.

DISEASES OF THE INTESTINES—THE TREATMENT OF ENTERALGIA OR COLIC.

Causes—Irritating Ingesta—Fæcal Concretions—Worms—Gall-stones—Imprisoned Gases—Cathartic Drugs—Exposure to Cold—Neurosal and Reflex Cases—Lead—Hysteria—*Symptoms* and Diagnostic Signs. *Indications for Treatment*—Relief of Pain—Opium—Enemata—External Applications—Purgatives—Castor Oil—Calomel—Hypodermic Injection of Morphine and Atropine—Use of Belladonna—Gouty Cases—Alkalies and Colchicum—*Colic in Infants*—Antacids, Carminatives, and Purgatives—Bromide of Potassium—Lime water—Treatment of *Rheumatic* and *Hysterical* Forms—Creasote and Thymol in Habitual Colic—Massage—Quinine in Malarial Cases—Milk Diet—*Nevralgic* Cases—Galvanism—Arsenic—Valerianate of Zinc—Warm Clothing—*Lead Colic* and *Plumbism*—Sources of Lead Intoxication—Symptoms. *Treatment*—Prophylactic and Remedial—Aperient Sulphates—Castor Oil—Opium—Enemata—Belladonna—Potassium Iodide—Electricity. Additional Formulæ.

By **enteralgia**, or colic, is meant all those *painful* affections of the walls of the intestines which are not caused by inflammation or by any structural changes in them. It is an affection of the sensory nerves of the intestine, analogous to gastralgia, or to the neuralgic affections of other sensory nerves. It must, however, be remembered that the same cause which excites a colic may, if it is not removed, produce inflammation.

As to the **causes** of enteralgia, they may be of two kinds—first, those which act by setting up irritation of the peripheral ends of the sensory nerves, *i.e.* causes acting within the intestinal canal itself: and secondly, causes acting on the sympathetic nerve trunks passing to the intestine, either through reflex excitement, or through physical change, in those nerves, as *e.g.* inflammatory thickening of their sheaths, or any other change which produces an abnormal irritability in them.

A frequent cause of colic is the presence of some irritating substance in the intestine, as indigestible or poisonous articles of food, the passage of gall-stones, of hard fæcal concretions, of masses of intestinal worms (*colica verminosa*). The distension of the bowel by *fæcal impaction* (*colica stercoracea*) may cause great irritation of the intestinal nerves from pressure on them. The retention of gas (*colica flatulenta*) from constipation is a common cause of colic, "the gas enclosed between an impacted fæcal mass below and a descending mass of fæces above gradually distends this circumscribed portion of bowel and excites severe pains, which, however, disappear as soon at the flatus escapes."* Flatulent colic is, however, more frequently produced by undigested fermenting ingesta, especially in infants; such articles of food undergoing abnormal decomposition produce flatulent distension of the bowel and traction upon the intestinal nerves. Mere excess, of otherwise wholesome food, may cause colic; or the habitual use of food containing some coarse, indigestible particles, as we have seen happen from the long-continued use of coarse brown bread. Some cathartic medicines such as "senna" are known to cause colicky pains.

Exposure to cold is a common cause of colic (*colica rheumatica*). It is difficult to understand precisely how this acts—probably in the same way as when an ordinary rheumatic myalgia or neuralgia is produced. We cannot think it is due, as Leube maintains, to the "suddenly cooled blood upon the surface of the body entering the intestinal vessels," it is more probably either a reflex phenomenon excited through the impression of cold on the peripheral nerves or it is caused by the retention in the blood of excrementitious substances which ought, ordinarily, to be eliminated by the skin, the excretory function of which has been suddenly arrested by the chill.

A *morbid state* of the sympathetic nerve trunks, or of their central connections, appears, in other cases, to be the cause of enteralgia, as in those rare instances of attacks of colic associated with disease of the spinal cord, or those connected with uterine, ovarian, renal, and other visceral affections. Lead colic seems to be, to a great extent, of this kind, as distinct anatomical changes have been found in the ganglion and nerve trunks of the sympathetic in acute cases.

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* Leube, in Von Ziemssen's "Cyclopædia of Practical Medicine," vol. vii. p. 460.

Hysteria, the parent of many forms of neuralgia, is also a cause of intestinal neuralgia.

The **symptoms** of enteralgia vary very greatly in intensity, the pain being in some cases but slight and in others so severe as to be almost unbearable. The attack will sometimes come on quite suddenly, at other times it may be preceded by nausea, slight griping pains, and flatulent commotion. The pain is usually most severe in the umbilical region, from which it may radiate into the flanks and groins. Firm pressure with the hands seems generally to afford a little relief; sometimes, however, this cannot be borne. When the pain is severe, it is accompanied with great restlessness, a pinched and anxious countenance; and beads of cold sweat stand out on the forehead, with cold extremities, a slow and small pulse, and great general depression. The abdominal muscles are hard and tense, and participate in the spasm. By placing the hand on the abdomen spasmodic contraction of the intestines may be distinguished in some parts and flatulent distension in others. The attacks of pain are sometimes periodic; they are apt to cease suddenly, with a feeling of complete relief. This often occurs on the discharge of fæces or flatus from the bowels. Usually there is **constipation.** Other symptoms which may accompany the attacks of intestinal pain are vomiting, hiccough, dyspnœa, desire to micturate, giddiness, faintness, and, in young children, sometimes convulsions. In infants these attacks cause great restlessness, constant crying, and retraction of the limbs.

It is important to be able to distinguish the pain of colic from that of inflammatory affections of the intestinal mucous membrane. This is not usually difficult, the sudden onset of severe pain, the absence of febrile symptoms, the relief afforded to the pain by firm pressure, the sudden disappearance of the pain on the escape of gas, or the passage of a motion, and the history of previous attacks, will usually enable us to arrive at a correct diagnosis.

In searching for further **indications** for **treatment** we should note whether the attack has been preceded by vomiting of indigestible food, or by obstinate constipation, or if there is evidence of the presence of nodular masses of indurated fæces in the course of the large intestine; if there is much abdominal distension and commotion from locked-up flatus; if worms have been passed or symptoms have been complained of pointing to their presence.

The *rheumatic* nature of such an attack may be inferred when it has occurred directly after exposure to chill, and from the absence of other causes.

From commencing *peritonitis* it may be difficult sometimes to separate it, especially in hysterical women, but the absence of thirst and fever and the fact that deep pressure is not more painful than light superficial pressure, and the position of the patient, the legs being drawn up and the body kept still in peritonitis, whereas there is often much twisting about of the body in colic, will usually serve to distinguish between them.

It is necessary to see that there is no hernia or other evidence of organic obstruction.

If the colic is due to **lead** poisoning, the history will usually disclose this. The long-continued obstinate constipation, the presence of a blue line on the gums, the existence of loss of power of the extensor muscles of the wrist, the scanty urine, and general dyscrasia are sufficiently characteristic.

With these preliminary considerations we may pass on to the **treatment** of enteralgia.

The **pain** of colic can almost always be relieved by *opium*, and it is to this drug the practitioner usually at first resorts. This is not, however, *always* commendable. It must be remembered that *opium* tends to arrest the intestinal secretions, and especially the outflow of bile, it lessens peristaltic action (one reason, indeed, for giving it), even to the extent, if it is pushed in large doses, of *paralysing* the muscular coat of the bowel. So that while it relieves the pain it does not remove the cause of the colic, which may be and frequently is, the presence of offending ingesta or of old fæculent accumulations in the intestines.

It is a far better and safer practice, unless we have good reason to know that there are *no* offending substances or fæculent accumulations in the intestine, to administer at once a large enema of warm soap and water (from 1 to 2 pints), with which we should mix 1 or 2 tablespoonfuls of castor oil, and, in cases of flatulent distension, a tablespoonful of spirits of turpentine. If the first enema comes away without affording much relief, another should be given after half an hour. At the same time a hot flannel or linseed poultice sprinkled with laudanum may be applied to the abdomen, or the surface of the abdomen may be rubbed with opium or belladonna liniment, and at the same time gently kneaded with the warm hand in the direction and along the course of the large intestine. There is not the same objection to the external use of opium as there is to its internal administration. If the enemata, repeated two or three times, fail to relieve, we may conclude that the large intestine does not contain any fæcal accumulation, an inference which should be corroborated by percussion over the cæcum and colon. In this case we should give some mild cathartic by the mouth, such as a tablespoonful of castor oil, or, if this is rejected by vomiting, 4 or 5 grains of calomel may be thrown on the tongue, and if the pain is still severe, a small dose of morphine ($\frac{1}{6}$ or $\frac{1}{8}$ grain) combined with it; or 5 to 10 minims of the liquor opii sedativus may be added to the castor oil, and this dose may be repeated after two hours if necessary.

If the pain is so severe as to point to persistent spasmodic contraction of the small intestine or to some intrinsic lesion of the intestinal nerves, it may be advisable to administer hypodermically $\frac{1}{6}$ to $\frac{1}{3}$ of a grain of morphine with $\frac{1}{120}$ to $\frac{1}{60}$ of a grain of atropine.

The use of opium is chiefly valuable for relieving intestinal spasm, and when it does this it may actually promote and assist the action of aperients on the small intestine. It is not, therefore, to this rational use of opium that we object, but to the routine and excessive use of this drug which we believe not infrequently converts a comparatively unimportant colic into a serious case of obstruction, by paralysing the abdominal walls. It is best, therefore, to cure an attack of colic without opium, if possible, and in that case the cure (with evacuants) will be speedy and complete.

It has been objected that aperients in these cases are apt to increase intestinal spasm, especially if given alone, but this objection cannot apply to *enemata*, with which the treatment of these cases should always be begun.

In cases where there is great intolerance of pain, one initial dose of opium (or a hypodermic injection of morphia) may be given at the same time that efforts are made to evacuate the bowels by enemata.

There is not the same objection to the use of belladonna and atropine in these cases as there is to that of opium and morphine; there is reason to believe that atropine lessens or removes the irritability of the intestinal nerves, and so relieves intestinal spasm as completely as opium, without locking up the contents of the bowel and arresting biliary and other intestinal secretions as opium does. We may, therefore, prescribe a warm carminative mixture containing belladonna, such as:— .

℞ Tinct. belladonnæ	30 minims.
Tinct. cardamomi comp.	6 drams.
Spir. ammoniæ aromat.	2 „
Spir. chloroformi	2 „
Sodii bicarb.	60 grains.
Aquæ carui	ad 6 oz.

M. f. mist. Two tablespoonfuls every hour until relieved.

At the same time we should give enemata. Or we may at once give $\frac{1}{60}$th of a grain of atropine hypodermically.

In cases which appear to be of a **gouty** nature we must give warm alkaline medicines and an aperient pill with colchicum each night, as the following :—

℞ Ammonii carb.	40 grains.
Sodii bicarb.	80 „
Spir. chloroformi	3 drams.
Tinct. zingib.	1 „
Aquæ cinnam.	ad 8 oz.

Two tablespoonfuls every three or four hours.

℞ Ext. colchici	½ grain.
Pil. rhei comp.	4 grains.

In pil. every night.

In infancy the colic is very frequently caused by unduly irritating acid contents of the intestine from abnormal decomposition of food, and this is accompanied with painful distension of the intestines with flatus. Such cases are best relieved by an antacid aperient and carminative mixture such as the following :—

℞ Pulvis rhei comp.	60 grains.
Spiritus ammoniæ fœtid.	30 minims.
Tincturæ cardamomi comp.	3 drams.
Spir. chloroformi	30 minims.
Aquæ carui	ad 1½ oz.

M. f. mist. A teaspoonful or two every hour until relieved.

If there is decided constipation, a dram or two of castor oil may be given or a grain of calomel may be thrown on the tongue and washed down with the first dose of the above mixture; and if there seems to be much painful spasmodic contraction of the intestine, half a grain or a grain, according to the age of the child, of compound ipecacuanha powder should be mixed with the calomel; that would be $\frac{1}{20}$th or $\frac{1}{10}$th of a grain of opium. If there should be a difficulty in getting the child to take medicine by the mouth, a clyster containing an emulsion of castor oil and a little oil of rue should be thrown up into the bowel. The following is a suitable formula :—

℞ Ol. ricini	...	1 to 3 drams.[*]
Ol. rutæ	...	2 to 6 minims.
Potassii carbonatis ...	...	5 to 15 grains.
Aquæ[†]	ad	2 to 4 oz.

This must be given with a rather long tube, or it may not be retained. If, after free evacuation of the bowels, there are still pain and distress, 1 or 2 minims of tincture of opium (if the child is over six months) may be given in 1 or 2 ounces of starch emulsion as an enema.

Dr. Ringer speaks of a form of colic in young children which is only relieved by bromide of potassium; the belly is retracted and hard, or the intestines "at one spot are visible, contracted into a hard lump, the size of a small orange," which can be felt "travelling from one part of the intestine to another." These attacks are, he says, "unconnected with constipation, diarrhœa, or flatulence." They cause "excruciating pain" and are sometimes "associated with a chronic aphthous condition of the mouth." Two to five grains of bromide of potassium or sodium may be given every hour in a dram of dill-water.

In colic in suckling children caused by the indigestion of milk, lime water should be given after suckling to prevent the coagulation of the milk, with which a few grains of calcined magnesia should be mixed.

In attacks of colic due to **chill** or of a rheumatic nature, hot applications to the surface of the abdomen are most useful, hot flannels sprinkled with turpentine or hot linseed-meal or bran poultices, after friction with opium or belladonna liniment. Warm drinks are also useful to promote diaphoresis, such as a breakfast-cupful of gruel, with a tablespoonful of brandy. A full dose of Dover's powder, 10 to 15 grains, should be given at bed-time, and some mild saline aperient the next morning, such as Carlsbad salts, one or two teaspoonfuls, in half a tumblerful of hot water every hour until the bowels are relieved. A flannel band should be always worn round the abdomen to prevent recurrences of the attack. In chronic cases of this kind iodide of potassium or salicine may be found useful.

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[*] According to the age of the child.

[†] Warm soap and water answers best.

In **hysterical** cases, usually attended with great flatulent distension, antispasmodic enemata are very serviceable, in combination with aperients. Four ounces of the *enema asafœtida* may be mixed with 4 ounces of the *enema aloes* and 4 ounces of warm soap and water, and administered with a long tube; or an enema may be made with 5 minims of *oil of rue* mixed with 2 drams of *ammoniated tincture of valerian,* and then added to 10 ounces of warm *infusion of valerian.* One or two drops of cajuput oil on a lump of sugar may be taken internally to relieve flatulence. Five grains of the aloes and asafœtida pill may be given night and morning; or better still a pill containing 1½ grain of powdered aloes, 1 grain of asafœtida, 1 minim of oil of cloves, and a grain of powdered soap.

If we have evidence that the colic is caused by **intestinal worms,** we must give the remedies necessary for their displacement.

One of the best remedies for slight but *habitual* flatulent colic is creasote or thymol; either of these remedies given immediately or soon after food prevents undue fermentation and development of gas. Half a minim of creasote or 1 grain of thymol may be made into a pill with 2 grains of powdered rhubarb and 1 of soap, and taken after each meal. Abdominal massage is also useful in these cases. In cases that can be distinctly traced to malarial influence quinine in full doses must be given; or arsenic if quinine cannot be tolerated.

A strictly *milk diet* will cure some obstinate cases by removing all possible sources of irritation from imperfect digestion of food.

In the *purely* **neuralgic** cases more difficulty will be encountered in obtaining speedy relief. The anodyne remedies already mentioned will, in most cases, afford temporary relief, but for permanent cure we shall probably have to have recourse to other means.

The general indications for treatment applying to other forms of neuralgia will apply in these cases also. Galvanism has proved very useful, and is highly commended by Leube, especially for the relief of meteorism. Arsenic has been strongly recommended, especially by Clifford Allbutt, in the treatment of neuralgic colic. In some exceptional cases, when the flatulent distension has been extreme, good results have followed puncture of the distended colon with a fine trocar, or with an exploring needle.

Valerianate of zinc, 1 grain three times a day, has proved useful in enteralgia arising reflexly in connection with uterine disease.

Persons prone to attacks of colic should be particularly observant in their diet, and carefully avoid those articles of food which appear to predispose to the attack. They should also clothe warmly, and wear a flannel belt round the abdomen; they should avoid sedentary habits, as well as any great fatigue or exhausting efforts, bodily or mental, and they should never suffer the bowels to become constipated.

The management of cases of **lead colic** requires special consideration.

Although lead colic as well as other symptoms of lead poisoning occur incidentally and occasionally from the introduction of lead compounds into the body in water, food, alcoholic beverages, hair dyes, snuff, etc., yet it is chiefly amongst the workers in lead factories that its severe characteristic forms are so frequently encountered. Plumbers and painters, also, from the necessity in their occupations of coming much into contact with lead, are prone to suffer from plumbism. Whenever we encounter the symptoms of lead poisoning, in others than those who are known to be brought into contact with this metal, or its compounds, in their occupation, it is necessary to make a very close inquiry—first, into the source of their water supply; and, if this is found free from possible contamination, secondly, into all the sources and modes of preparation of all the articles of food and drink consumed. Wine, cider, sour milk, beer, ginger-beer, lemonade, hair dyes strongly impregnated with lead have all, at times, been found to give rise to lead colic. Flour, bread, and cakes have, also, been found to contain lead, and to give rise to plumbism.

The symptoms of acute lead colic are thus described by Professor Thomas Oliver, M.D.*

"The patient is suddenly seized with an acute pain in the abdomen. Confined to the region of the umbilicus, sometimes a little above it, but more frequently to the left, the pain is either of a twisting or grinding nature, or it creates a sense of weight and constriction. These pains are simply excruciating. Sometimes the patient receives relief from pressure, sometimes from warmth; at other times he is unable to be touched. The colic subsides, only to recur in paroxysms, and with a tendency to nocturnal exacerbation. Generally, after the acuteness of the pain has subsided, nausea, retching, or vomiting of a thin, greenish liquid occurs, accomplished with difficulty, and accompanied by restlessness. The secretion of the urine is diminished, and the pulse is hard and slow. In such a case under treatment, the pain, gradually subsiding in severity, keeps returning in milder and milder paroxysms; the vomiting abates, the bowels yield to purgatives, the spirits improve. In a few days the patient is convalescent." Together with these painful abdominal symptoms we observe other general symptoms of *plumbism*, pallor and sallowness of the complexion with anæmia, pinched features, a small, rapid pulse, a characteristic *blue* line on the gums, a metallic taste in the mouth, headache, weakness in the limbs, sometimes extreme wasting of the extensor muscles of the hands, and "*dropped wrists*," loss of appetite, and most obstinate constipation. With other forms of lead poisoning we are not at present concerned.

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* "Lead Poisoning in its Acute and Chronic Form." Young J. Pentland. 1891.

The **treatment** of lead colic may be prophylactic or remedial. For the former purpose we should carefully see that in the storage and conveyance of drinking water it should come into contact, not at all, or as little as possible, with the metal lead, nor should any ordinary foods or beverages be stored up, or wrapped in leaden receptacles or envelopes. When it has been found impracticable to prevent altogether the contact of drinking water with lead, the addition of carbonate of lime in the proportion of 2 grains to the gallon causes a protective coating to form on the interior of the pipe, and the risk of lead poisoning is thus greatly diminished, or wholly prevented. Silica acts in the same way. Persons employed in lead factories should be regularly examined for symptoms of plumbism, and when any of these are detected those persons should at once be suspended from work. As in white lead works the powder enters the body commonly by inhalation through the respiratory organs, or from want of cleanliness in feeding, the powder collecting on the hands is conveyed with the food into the mouth, obvious precautionary measures are to insist on the operatives wearing suitable respirators, and bathing the body, and especially carefully washing the hands before taking food. Sulphuric acid lemonade, a drink acidulated with sulphuric acid, and sweetened with sugar, or a drink of sulphate of magnesia (!), acidulated with sulphuric acid, is kept in most lead factories, and the workers are encouraged to drink it in the belief that any soluble compounds of lead that might reach the stomach would then be thus converted into the insoluble sulphate, and so be rendered harmless. Such drinks certainly have a preventive influence, but the workers cannot be induced to drink them as freely as desirable. This can readily be understood if the bitter and unpleasant sulphate of magnesia is added to them.

Professor Oliver* considers "that no man or woman should be allowed to begin the toil of the day without having had a substantial meal, experience and experimental investigation having shown that during the process of digestion little or no lead is dissolved and absorbed." He also thinks that "total abstinence is a physiological necessity" to lead workers.

The **medicinal** treatment must correspond to the following indications:—(1) To relieve the constipation and pain; (2) to promote the elimination of the lead from the body. In response to the *first* indication, it is usual to give the aperient sulphates in combination with sulphuric acid, for not only do they, as purgatives, relieve the constipation, but as sulphates they precipitate any soluble salts of lead there may be in the intestinal canal in the form of the insoluble sulphate. Castor oil may also be given, but the sulphates are preferable. Should the pain be very severe a hypodermic injection of morphine ($\frac{1}{4}$ grain) and atropine ($\frac{1}{60}$ grain) may at the same time be given; or an opiate and belladonna liniment (lin. opii, lin. belladonnæ, āā $\frac{1}{2}$ ounce) may be rubbed in freely round the navel, or a large warm enema of soap and water, one or two pints, may be given, with which an ounce of castor oil, $\frac{1}{2}$ an ounce of turpentine, and 20 minims of laudanum should be mixed.

The following mixture of aperient sulphates may be prescribed:—

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* *Op. cit.*

℞ Magnesii sulphatis	āā 1½ oz.
Sodii sulphatis	
Acid. sulphuric. aromat.	60 minims.
Syrupi zingib.	½ oz.
Aquæ cinnamomi	ad 12 ,,

M. f. mist. Four tablespoonfuls every hour until the bowels are completely relieved.

The action of this mixture should be aided by large enemata if necessary. The aperient doses may be repeated as required.

Belladonna has been found very efficacious in the relief of lead colic by some physicians. Small doses (1/6 to 1/4 grain of the extract) should be given frequently, every hour or half hour, and the doses should be increased until the full physiological effect of the drug is established.

To fulfil the *second* indication, viz. to procure the **elimination** of the poison, potassium iodide must be given. This salt forms a soluble compound with the lead deposited in the tissues, which is then re-absorbed into the blood, and eliminated by the kidneys. The presence of lead in the urine may be detected soon after the administration of the iodide. It may be combined with sulphate of magnesia.

The following is an excellent formula, to be prescribed after the relief of the severe colic :—

℞ Potassii iodidi	40 grains.
Magnesii sulphatis	1 oz.
Tinct. nucis vomicæ	120 minims.
Aquæ cinnamomi	ad 8 oz.

M. f. mist. Two tablespoonfuls night and early morning.

So rapid often is the solvent action of the iodide, that Professor Oliver calls attention to a certain amount of risk attending its use when there is a large amount of lead deposited in the tissues ; he has known the general symptoms of plumbism to increase under its influence, and sudden death to occur, "due in great measure to the rapid entrance into the blood of a large amount of soluble lead salt." Caution must, therefore, be observed in its use.

Professor Semmola has employed electricity, with good effect, to promote the elimination of the poison. The patient is put into an acidulated bath with one pole of the continuous current upon the tongue and the other in the water. In other cases one pole was placed upon the tongue and the other on the epigastrium, without the bath. The examination of the urine, it is said, showed increased elimination of lead, and the blue line disappeared in a few weeks.

ADDITIONAL FORMULÆ.

For colic.

℞ Pulv. rhei, 30 grains.
Tinct. rhei, 3 drams.
Magnesii carb., 1 dram.
Tinct. opii, 15 minims.
Spiritus anisi, 6 minims.
Spiritus menthæ pip., 2 drams.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful three times a day. (*Naphey.*)

For flatulent colic.

℞ Spirit. chloroformi, 1 oz.
Tinct. cardamomi comp., 1 oz.

M. f. mist. A teaspoonful every half hour in water. (*Bartholow.*)

For hysterical and flatulent colic.

℞ Tinct. lavandulæ comp., 1 oz.
Aquæ camphoræ ad 4 oz.

M. f. mist. A tablespoonful every hour or two. (*Bartholow.*)

For flatulent colic.

℞ Magnesii carbonatis, 1½ drams.
Ammonii carbonatis, ½ dram.
Tinct. lavandulæ, 2 drams.
Spiritus carui, 1 dram.
Syrupi zingiberis, 2 drams.
Aq. menthæ viridis ad 6 oz.

M. f. mist. A tablespoonful occasionally. (*Fenwick.*)

For the pain of colic.

℞ Chloroformi, 2 drams.
Morphinæ acetatis, 3 grains.
Olei anisi, 16 drops.
Olei menthæ pip., 16 drops.
Syrupi acaciæ, ½ oz.
Aquæ camphoræ ad 4 oz.

M. f. mist. A teaspoonful for a dose. (*Ludlow.*)

Enema for flatulent colic.

℞ Ol. terebinth., 1 oz.
Pulv. acaciæ, q.s.
Decoct. hordei ad 20 oz.
M. f. enema. (*Hooper.*)

Aperient draught for colic.

℞ Ol. ricini, 6 drams.
Tinct. rhei, 2 drams.
Tinct. opii, 20 minims.
Aquæ cinnam. ad 2 oz.

M. f. haust. To be taken immediately. (*Whitla.*)

Draught for flatulent colic with constipation.

℞ Ol. cajuputi, 4 minims.
Sacchari alb., 10 grains.
(Rub together and add)
Tinct. jalapæ, 1 dram.
Dec. aloes co. ad 1½ oz.

M. f. haust. (*Paris.*)

For colic from impacted fæces.

℞ Strychninæ, 1 grain.
Extr. belladonnæ, 4 grains.
Podophyllin, 4 grains.
Pulv. ferri sulph., 20 grains.
Aloes Socot., 20 grains.
Syrupi, q.s.

M. et divide in pil. 20. One every eight hours. (*Montgomery.*)

For infantile colic.

℞ Magnesii carb., 20 grains.
Syrupi zingib., 3 drams.
Spt. chloroformi, 20 minims.
Aquæ anethi ad 2 oz.

M. f. mist. A teaspoonful every hour if necessary.

For severe colic in infants.

℞ Tincturæ cascarillæ, 10 mins.
Tincturæ krameriæ, 10 mins.
Olei anthemidis, 1 or 2 drops.
Syrupi simplicis, 2½ drams.
Aquæ ad 2 oz.

M. f. mist. A teaspoonful every two hours. (*Prof. Widerhofer, Vienna.*)

Mixture for infantile colic.

℞ Spirit. ammoniæ fœtid., 10 minims.
Ol. anisi, 4 minims.
Tinct. opii, 4 minims.
Magnesii carb., 20 grains.
Pulv. rhei, 10 grains.
Syrupi simp., 1 dram.
Aquæ ad 2 oz.

M. f. mist. One to two teaspoonfuls every 3 hours. (*Brereton.*)

Alum mixture for lead colic.

℞ Alumenis, 2 drams.
Acid. sulph. dil., 1 dram.
Syrup. limonis, 1 oz.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every hour or two. (*Bartholow.*)

For the constipation of lead colic.

℞ Magnesii sulphatis, 1 oz.
Acid. sulph. dil., 1 dram.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every three hours. (*Bartholow.*)

CHAPTER IX.

DISEASES OF THE INTESTINE—THE TREATMENT OF HABITUAL CONSTIPATION.

Causes—Faulty Dietetic Habits—Insufficient Ingestion of Water—Defective Secretion of Bile—Loss of Muscular Tone in the Intestinal Walls—Negligence to solicit Action of Bowels. *Symptoms*—Dyspeptic Troubles—Headache—Defective Nutrition—Depression of Spirits—Restlessness—Pressure Symptoms—Circulatory and Neurosal Disturbances—"*Fæcal Fever.*" *Treatment*—*Indications*—(a) *Dietetic*—Water—Fresh Vegetables and Fruits—Oatmeal, etc.—Fats and Oils—Grapes—Linseed—(b) *Regiminal*—Exercise—Gymnastics—Massage—Cold Affusions and local Douches—Electricity—Abdominal Belt—Cheerful Occupations—(c) *Medicinal*—Saline and other Purgatives—Enemata—Mechanical Removal of Indurated Masses—Objections to Enemata groundless—Glycerine Injections—Cholagogues—Calomel—Podophyllin—Dinner Pills—Bitter Waters—Carlsbad and Marienbad Salts—Courses of Mineral Water—Hydrotherapy—Belladonna—Opium—Nux Vomica and Tonics—Insufflation of Boric Acid. Additional Formulæ.

Constipation, for our present purpose, must be regarded simply as an abnormally prolonged retention of the fæces, or their habitual expulsion, with difficulty, and in defective quantity. We ought, perhaps, also to add—when this leads to personal discomfort and derangement of health; because many persons habitually have an action of the bowels only on alternate days, or at longer intervals, and their health and comfort are in no respect disturbed thereby, whereas the failure to secure a daily evacuation will, in others, be attended with much discomfort and impairment of health.

In considering the **causes** of habitual constipation with a view to its successful treatment, we must, *in the first place*, point out how often it depends on faulty **dietetic** habits, especially in the addiction to too highly concentrated foods, and to the too sparing use of water. A diet composed almost exclusively of easily digested animal food will leave but little waste as a result of its digestion, and so produce constipation by not supplying that stimulus to the nerves of the intestinal mucous membrane which a normal amount of indigestible residue would do. Constipation may also follow the use of articles of food leaving too highly stimulating a residue, the repeated contact of which finally exhausts the excitability of the intestinal walls. Often too **dry** a diet may be the cause of constipation; the water taken being in insufficient quantity to keep the contents of the intestinal canal in a fluid, semi-fluid, or soft condition; the freer also the supply of water to the blood the more abundant and fluid the intestinal secretions are likely to be; whereas a defective supply of water will naturally diminish the amount of the fluid secreted by the intestinal glands. A comparatively dry condition of the intestinal canal is thus induced, and the progress of the residue of the food along it is thereby retarded.

The same result will follow the excessive loss of fluid through the skin, kidneys, or lungs, if this loss be not compensated for by an adequate increase in the water ingested. Excessive muscular exertion, or exercise, in persons disposed to perspire freely, may thus contribute to the constipated habit, and we must bear this in mind when prescribing exercise for its cure, or in ordering Turkish baths. Diabetes, and certain nervous states, attended with an excessive flow of urine, hyper-lactation causing a loss of water from the blood through the mammary glands, and feverish states, which cause both cutaneous and pulmonary transpiration, as well as lessened intestinal secretion, all tend to produce constipation.

An exclusive milk diet, as well as so-called "fasting" cures, cause constipation by leaving an insufficient residue to excite intestinal peristalsis. Too great *uniformity* in diet will tend to have the same effect by leading to diminished sensibility of the intestinal canal.

Secondly; deficiency of the intestinal secretions—of *bile* and intestinal juices, irrespective of dietetic habits, may cause habitual constipation. In many persons there would seem to be a constitutional tendency to defective secretion of bile and the intestinal juices, just as in others there is a tendency for the cutaneous secretion to be defective.

Thirdly : chronic constipation may be due to a want of tone, a loss of muscular propulsive power in the intestinal walls, either from defective nutrition, or imperfect innervation, or from intrinsic structural changes. Under this head we include the cases which depend on bodily inactivity and insufficient exercise in the open air, associated with sedentary habits, or too exclusively intellectual occupations, or from whatever other cause. Hysterical, anæmic, and hypochondriacal states, although often, to some extent, *effects* of constipation, may also contribute to *cause* this state by the defective innervation and nutrition of the muscular system generally which they induce. We may also here include those cases of constipation dependent on paralysing lesions of the spinal cord, which affect not only the motor nerves of the intestinal canal, but also those of the abdominal muscles.

Or the loss of tone may depend on structural changes in the intestinal walls; as an œdematous condition from chronic renal or cardiac disease, or degeneration or wasting of the muscular coat as in convalescence from exhausting fevers, and in the cachexia of many chronic diseases, as well as in senile degeneration.

It is owing to the morbid changes produced in the intestinal walls in chronic gastric catarrh that this disease becomes one of the commonest causes of habitual constipation.

Fourthly : a common cause of chronic constipation is a habit of indolence, or carelessness, in neglecting to solicit a regular periodical evacuation of the bowels. The natural impulse to defæcation is at first disregarded, the sensibility of the rectal mucous membrane is thereby blunted, considerable accumulations occur in the rectum and sigmoid flexure of the colon, and many days often pass without a stool. Women are especially addicted to this injurious habit. Occasionally it is dependent on some painful condition of the anus (fissure, eczema, etc.), and the natural impulse to evacuate the bowel is voluntarily resisted in dread of the pain caused by a motion.

Fifthly: it has been pointed out that women are more prone to constipation than men, not only on account of their more sedentary habits and indolent disregard of the calls of nature, but also from organic causes. "At every menstrual period the uterus enlarges, and exercises a greater compression on the rectum. A tender and enlarged ovary (and at the menstrual epoch the ovary is always tender and enlarged) exercises an inhibitory action upon the muscles which bring the fæces in contact with it in their downward passage. In the married woman recurring pregnancies lead to the habit of constipation from the long-continued pressure upon the colon, sigmoid flexure and rectum, from the extreme stretching of the abdominal muscles, and from the paralysing effect of compression during labour. The relaxed condition of the pelvic and abdominal organs after labour offers no resistance to the distension of the rectum and sigmoid flexure. The cessation of the catamenia is accompanied with constipation, nervousness, and a feeling of ill-defined apprehension when the bowels are moved, or abdominal pains deter many persons, chiefly women, from habits of regularity. All uterine and ovarian derangements by mechanical or reflex means bring about the same result."*

On the other hand, habitual constipation tends to produce in women hyperæmia of the uterus, with menorrhagia and uterine catarrh, and even more serious disease of that organ.

Habitual constipation is often accompanied by a disagreeable train of **symptoms**, which may here be briefly enumerated (some of these are probably due to the mechanical and obstructing effects of the retained fæces, and others to the absorption into the blood from the intestinal surface of toxic substances resulting from putrefactive changes in the retained excrement): loss of appetite, coated tongue, and bad taste in the mouth, impaired digestion, flatulent distension and oppression causing palpitation and dyspnœa, defective nutrition, wasting and anæmia, headaches, flushing of the face, spots before the eyes. great depression of spirits and irritability of temper, the sleep disturbed by dreams, and the nights restless. Cutaneous eruptions sometimes appear.

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* Professor W. W. Johnstone's article "Constipation." Pepper's "System of Practical Medicine," vol. ii. p. 640.

Owing to local pressure of the retained fæces on the vessels and nerves in the neighbourhood of the rectum and sigmoid flexure, we may, occasionally, get œdema of the feet (from pressure on the iliac veins), but more commonly *cold* feet, hæmorrhoids (from pressure on hypogastric veins); men may have troublesome erections and seminal emissions (from pressure on the pudic veins), and sciatica, and neuralgic pains in the legs, and a feeling of numbness due to pressure on the nerves of the sacral plexus. A *feverish* state is not uncommonly induced in some cases of habitual constipation, the temperature rises to 101° or 102° F. (some physicians have observed much higher temperatures), with this rise of temperature there are usually a dirty tongue, a bad taste in the mouth, high-coloured urine, complete loss of appetite, and great physical and mental depression. We have been accustomed to apply to this state the term "*fæcal fever.*" It may last a considerable time, even if the bowels are well acted upon, and the loss of appetite often lasts much longer.

The **treatment** of habitual constipation must respond to the following indications:—

1. A suitable regulation of the diet and regimen.
2. An enforcement of healthy habits of life.
3. The adoption of such remedial measures (medicinal or other) as shall immediately overcome

the existing constipation, and prevent its recurrence; the latter by improving the digestion, promoting intestinal secretions, and giving tone to the intestinal walls.

And (1), *as to* **diet.**

When we have reason to think an insufficient amount of water is taken, that deficiency must be supplied. A tumblerful of cold water should be drunk slowly while dressing in the morning, again on going to bed at night, and half an hour before dinner—the latter may be taken hot, if preferred. This water should be as free as possible from lime-salts, distilled water is best ("salutaris" water is of this kind); slightly mineralised effervescing waters will also serve the purpose, such as seltzer water, apollinaris water, etc. Brown or rye bread, fresh vegetables—spinach, sorrel, beet-root, watercress, salads, plainly boiled Spanish onions, and ripe fruits should form a regular part of the diet; plums, prunes, grapes, figs, baked apples, stewed pears, oranges, bananas—foods leaving considerable amount of undigested residue which exercises a stimulating action on the intestinal walls, and increases the bulk of the fæces. But it is an error to irritate the bowel by too large quantities of coarse and indigestible substances. The amount of animal food should be strictly limited, and should be in comparatively small proportion to the vegetable element. An excess of eggs, milk, and farinaceous foods, as they leave but little indigestible residue, must be avoided. Although milk by itself is constipating, it is not so when mixed with coffee, and a cup of *café au lait* on rising in the morning will often produce a laxative effect. Maize and oatmeal are slightly aperient, and may be taken with advantage. Honey and treacle are also slightly laxative, and either may be taken with oatmeal porridge or with brown wholemeal bread. Gingerbread, which is made with honey, is decidedly laxative. Ginger nuts are also useful. Honey and marmalade, eaten with bread and butter, are good.

A due proportion of fats and oils is also beneficial, as they escape to some extent digestion in the small intestine, and serve to lubricate and soften the fæculent mass which passes into the large intestine. Plenty of fresh butter is, therefore, useful, and so, too, is olive oil taken freely with salads; or a dessertspoonful of this oil may be mixed with potato, beet-root, or other vegetable at meals. The laxative effect of 4 to 6 lbs. of grapes taken as a "grape cure" daily, has been found of value in overcoming chronic constipation.

Linseed—such as linseed-tea is made with—has been recommended by some French physicians as a good remedy for habitual constipation. A little water is poured on a dessertspoonful or tablespoonful of linseed, allowed to stand for one hour, and the whole drunk immediately before a meal.

When from defective appetite or painful digestion an insufficient quantity of food is taken to yield the necessary stimulus to peristaltic contraction in the intestinal canal, measures must be directed to removing the dyspepsia and improving the appetite.

(2) The enforcement of **healthy habits** of life is of great importance. Physical inactivity, from indolence or from too studious habits, or from too assiduous devotion to sedentary occupations, is a fruitful cause of habitual constipation, and in all such cases an adequate amount of regular exercise should be insisted upon.

Bodily exercise is a means of exciting peristaltic action in most persons (provided it is not attended by such profuse perspiration as to lead to an excessive loss of water by the blood). Respiration is thereby quickened, the action of the diaphragm and abdominal muscles is increased, and the circulation of the blood promoted, and these, no doubt, tend to restore tone to the intestinal muscles, and in this way heighten peristaltic action.

The influence of bodily exercise may be aided by methodical abdominal massage and suitably devised gymnastics.

The following is the method that should be followed in applying abdominal massage for the cure of constipation:—Begin by kneading the abdominal integuments and muscles, pressing gently over the cæcum with the tips of the fingers (palmar surfaces); then, by means of the closed fists, we should apply gentle but deep massage along the whole course of the colon. The patient should empty the bladder beforehand, and the process should not last longer than from 15 to 20 minutes each time.*

The importance of habitually soliciting an action of the bowels periodically, *i.e.* at a given hour daily, should be, in all cases, pointed out. This is particularly necessary with young girls at the age of puberty, when they are apt to be very neglectful in this respect, and so lay the foundation of much future trouble through inattention to the daily evacuation of the bowels. The daily habit of cold sponging, or bathing with friction of the surface, is of much use, and this may be reinforced by cold douches or cold affusion, or the application of cold compresses to the abdomen. Measures of this kind, when persevered in, have proved successful in curing obstinate cases of constipation.

Perineal and anal douches have also proved useful by exciting locally the muscles of defæcation.

Any habitual pressure from tight clothing round any part of the abdominal cavity should be rectified.

We are not greatly in favour of electrical treatment or treatment by Swedish movements unless in very obstinate cases that cannot be relieved by other measures. These two modes of treatment have seemed to us to make the patient far too dependent on their continued application, and to foster that morbid introspective attention to their bodily sensations which they are already too prone to, and which is, in itself, a malady. Where, however, the constipation seems to depend on feebleness of the abdominal muscles, the regular application of the interrupted electrical current may be of use in promoting their better nutrition and tone. In such cases, especially after repeated pregnancies, the wearing of a well-fitting elastic *abdominal belt* should be insisted upon.

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* Berne, "Traitement de la Constipation par le massage abdominale." Paris, 1887.

(3) Finally, we have to consider the **medicinal** measures that may be effectual in curing constipation. Accidental or *occasional* constipation is usually readily overcome by some simple aperient dose. One of the most effectual is a pill composed of ½ a grain of calomel, 2 grains of extract of aloes, and 1 grain of extract of henbane, to be taken at bed-time, and 2 drams of sulphate of soda in a tumblerful of hot water the first thing the following morning. This is a very effectual dose, which rarely causes any griping and relieves the bowels completely. A seidlitz powder in a large tumblerful of cold water early in the morning for the next few days will usually be all that is needed to restore regularity to the bowels in such cases of occasional and accidental constipation.

The medicinal treatment of *habitual* constipation is, however, more difficult. Whenever it is easy or possible to overcome the habit of constipation without recourse to drugs, these should certainly be avoided; but in very many cases it will certainly be necessary to use some medicinal aids to initiate a more healthy action of the bowels, and no good can arise from uselessly alarming patients about the injurious effects of laxatives.

At the outset, then, it is most important to completely clear the intestinal canal of all fæcal accumulations, and to ascertain by manipulation and percussion that the large intestine, throughout its entire course, is thoroughly emptied and contracted. For this purpose such a dose as we have just suggested may be given for three or four consecutive days, or until by examination of the motions and by palpation and percussion of the abdomen we are satisfied that no fæcal accumulations have been left behind. If, however, we perceive evidence of hard lumps remaining in the large intestine, or if small, dry, light concretions float on the surface of the fluid evacuations, we must wash out the large intestine by **enemata.** Those enemata must be administered by means of a long tube, or the patient must be placed on his left side, or, better still, in the kneeling posture, with his head and shoulders depressed and the buttocks elevated ; in this position the fluid will flow of its own weight into the large intestine, and remain long enough to soften old, hard, dry, fæcal concretions which may be retained there. Each enema should be retained for 10 to 15 minutes. The enema may be best composed of warm soap and water, from a pint to a pint and a half or two pints, according to the capacity of the colon. This enema, which is simply for the purpose of washing out the colon and softening any hard concretions that may be in it, should be given daily until we are satisfied it has accomplished the purpose for which it was ordered. In very chronic and obstinate cases it will be advisable to continue the daily use of an enema (in the same position of the body), which should now consist either simply of a pint of cold water, or a pint of cold water with a teaspoonful of common salt and half a teaspoonful of sodium bicarbonate dissolved in it. This daily use of such a cold enema for some months together, with a properly-regulated diet and a daily dinner pill (preferably immediately before dinner), consisting of 1 or 2 grains of extract of aloes, a grain of powdered ipecacuanha, a grain of extract of nux vomica, and a grain of soap, we have seen completely restore the health of those who have ailed for years in consequence of chronic constipation.

In old, bed-ridden, and paralysed people it is not unusual to find very large accumulations in the rectum of hard fæces which no enema tube can penetrate ; in such cases it is necessary, by means of the finger, or a spoon or scoop of some kind, to mechanically dislodge from the rectum as much of this accumulation as can be reached, and then to use softening enemata until the large intestine is thoroughly emptied, and to continue the daily use of an enema to prevent future accumulations. In cases like these, as it may be impossible to place the patient in the posture previously described, he may be turned over on his left side, or the buttocks may be raised by placing a hard hair-pillow under them; unless some contrivance of this kind is adopted, or a very long tube used, it will be found that the enema is often immediately rejected, and does not get beyond the rectum.

We consider enemata are far too little used in England for the relief of constipation. We cannot accept the statement which has been made to the effect that their use produces a feebleness of the muscular coat of the colon, so that the bowels will not act without artificial stimulation. We cannot see how the contact of simple cold water or salt and water can over-stimulate or cause muscular weakness in a part which is naturally and constantly brought into contact with far more irritating substances. On the contrary, we believe the contact of cold salt and water with the surface of the intestine by promoting muscular contraction imparts tone to the bowel, and prevents atonic dilatation.

The use of a small injection of *glycerine* for the relief of a loaded rectum has marked an advance in the treatment of some forms of constipation.

A patient can now make certain of an action of the bowels in a few minutes instead of having to wait the number of hours it may take for an aperient pill or draught to produce its effect.

It is, however, chiefly to the relief of an accumulation in the rectum and sigmoid flexure that this applies. It is, therefore, valuable in cases where the rectum or sigmoid flexure is subjected to mechanical pressure, as in pregnancy and other pelvic tumours, and also in those persons who experience a difficulty in defæcation owing to the dryness and hardness of the fæcal mass. It is, however, of only auxiliary service in the treatment of most cases of chronic constipation. A teaspoonful or two of glycerine may be injected by means of one of the small syringes supplied for this purpose, or a suppository containing glycerine may be employed, but we have not found them so trustworthy. In some instances we have found a tablespoonful of glycerine mixed with 2 or 3 ounces of water answer better than pure glycerine.

When the constipation is associated with what is called "**biliousness**," and the tongue is thickly coated, the complexion sallow, the conjunctivæ bile-tinted, and the stools pale and offensive as well as scanty, and the urine high-coloured; or when troublesome hæmorrhoids are present, it is necessary to promote the outflow of bile by the use of cholagogue remedies, and in the latter case by causing a free outflow of fluid from the intestinal vessels we relieve venous congestion and thereby remove hæmorrhoidal distension. We should in such cases prescribe a grain of calomel or 2 grains of blue-pill, or $\frac{1}{6}$th of a grain of resin of podophyllum, with 5 grains of compound rhubarb pill, or with 5 grains of colocynth and henbane pill, at bed-time, and a teaspoonful or two of Carlsbad salts in a tumblerful of hot water the following morning. Podophyllin proves a very irritating and unpleasant purge to some persons, but others are able to take regularly a teaspoonful of a tincture made by dissolving a grain of podophyllin in an ounce of compound tincture of cardamoms, without any unpleasant effects, and we have seen it prove very efficacious in the relief of hæmorrhoids, no doubt by the amount of fluid it causes to be discharged from the intestinal surface.

There is a number of medicinal expedients for relieving the milder forms of habitual constipation; few are better than the more or less regular use of a **dinner pill** such as the following:—

℞ Aloes extracti	1½ grain.
Ipecac. pulv.	½ „
Nucis vomicæ extracti	½ „
Quininæ sulph.	1 „
Saponis	½ „

M. f. pil. To be taken immediately before dinner.

A tumblerful of cold water, or, if preferred, of an effervescing slightly alkaline water, may be at the same time taken night and morning.

Some patients prefer taking their aperient in the morning in the shape of one of the **natural purgative waters**; such as Hunyadi Janos, Friedrichshall, Pullna, Birmenstorf, or Rubinat; these contain the aperient and bitter sulphate of magnesia, and hence, in Germany, they are called *bitter waters*. A few ounces, 4 to 8, of any of these waters taken fasting, act rapidly with most persons, and produce one or two loose motions. In others, however, they cause a good deal of flatulent distress, and are not easily digested. Carlsbad or Marienbad salts, composed chiefly of sulphate of soda, act more comfortably with many patients than the bitter waters. The dose is one to three teaspoonfuls dissolved in a tumblerful of hot water.

In cases in which habitual constipation is associated with a tendency to corpulency, what the Germans call "abdominal plethora," excellent results are obtained from a course of waters at Carlsbad, Marienbad, Tarasp, Brides les Bains, or, at home, at Harrogate or Leamington.

In more purely dyspeptic cases, and where there is much want of tone in the whole alimentary canal, the waters of Kissingen, Homburg, and Brides answer exceedingly well.

In such cases a course of ordinary hydrotherapy in a well-conducted hydropathic establishment is also often of great value.

Belladonna, ever since Trousseau warmly advocated its use in chronic constipation, has been largely employed in its treatment. It may be given combined with nux vomica or associated with aloes, ipecacuanha, or other aperients. It is best at first to try its effect alone, or in combination with nux vomica; from $\frac{1}{6}$ to $\frac{1}{2}$ grain of extract of belladonna with $\frac{1}{2}$ a grain or a grain of extract of nux vomica may be given in a pill every night at bed-time. If this fails it may be combined with aloes, or ipecacuanha, or both.

The following formula has been found a good one :—

℞ Aloinæ	4 grains.
Strychninæ sulph.	$\frac{1}{4}$,,
Ext. belladonnæ	$1\frac{1}{2}$,,
Pulv. ipecac.	6 ,,

Mix and divide into twelve pills. One daily.

Employed alone, belladonna seems to be more efficacious in women than in men, and appears especially applicable to those cases of constipation where a painful condition of some of the pelvic viscera (uterus or ovaries) tends to constipation by inhibition of intestinal peristalsis. Opium in very small doses has been said to act as an aperient in similar cases.

It is only necessary to enumerate a number of other useful aperient medicines which have proved of value in the treatment of chronic constipation: compound liquorice powder; confection of senna; sulphur in the form of confection or lozenges, or tabloids; cascara sagrada, now very largely used in a variety of forms; euonymin; citrate of magnesia; Dahl's cakes; all these are useful in appropriate cases, and enable us also to change the aperient from time to time, which will be found advisable.

Of all these perhaps *cascara* is at present the most popular, and it is presented to the public in every possible form—syrups, extracts, tinctures, capsules, lozenges, tabloids, etc. Its *prolonged* use, two months or more at a time, has been especially advocated for the relief of habitual constipation. It is, however, somewhat difficult to estimate accurately the dose that is best suited to individual cases, and it is highly desirable to use the smallest dose that is consistent with efficiency; 20 or 30 minims of the fluid extract may be given at bed-time, and its effects noted, and the subsequent doses regulated accordingly. If taken in large purgative doses it is usually followed by constipation, and the point in its administration is to give just the quantity needful to procure one soft evacuation daily, and no more. Some find it best to give a small dose—5 to 10 minims—three times a day, directly after meals, rather than a single dose at night; attempts should be made to diminish the dose and finally, if possible, to do without the drug entirely.

The following are suitable modes of prescribing it:—*

℞ Extr. cascaræ sagradæ liquid.	1 oz.
Tinct. aurantii cort. recentis	2 drams.
Spir. rectificati	1 ,,
Syrupi	6 ,,
Aquæ cinnamomi	ad 4 oz.

M. f. mist. Half a teaspoonful to three teaspoonfuls for a dose. Or:—

℞ Extr. cascaræ sagradæ liquid.	½ oz.
Extr. glycyrrhizæ liquid.	3 drams.
Tinct. cardamomi comp.	½ oz.
Syrupi	3 ,,

M. f. syrup. One to four teaspoonfuls for a dose.

Cases of chronic constipation associated with general debility and anæmia, and dependent on want of muscular tone in the intestinal walls, require tonic as well as aperient treatment. In such cases nux vomica or strychnine with quinine and iron is especially useful. In the constipation of chlorosis the following prescription will be found valuable:—

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* We have found the sugar-coated tabloids of Burroughs and Wellcome a most convenient and efficacious form.

℞ Ferri et quininæ citratis	80 grains.
Liq. strychninæ	40 minims.
Syrupi simplicis	1 oz.
Aquæ	ad 8 ,,

M. f. mist. Two tablespoonfuls to be taken twice a day, an hour before food.

℞ Aloes extracti	2 grains.
Belladonnæ extracti	$\frac{1}{6}$,,

M. f. pil. To be taken every night.

Or the following, which is very efficacious, but not so agreeable to take :—

℞ Ferri sulphatis	16 grains.
Magnesii sulphatis	1 oz.
Quininæ sulphatis	12 grains.
Liq. strychninæ	40 minims.
Acid. sulphuric. dilut.	40 ,,
Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls twice a day an hour before breakfast and dinner.

This mixture will often succeed in overcoming constipation in anæmic women after most other aperients have failed.

The insufflation of boric acid into the lower bowel —about 45 grains at a time—has recently been strongly advocated for the relief of that form of chronic constipation that depends on torpor of the colon. The patient should keep quiet for a time, and after two or three hours peristaltic action will be excited in the colon. Dr. Flatau, who advocated this method at the Berlin Medical Society, stated that he had never found it fail or cease to be effective, and if systematically applied daily, permanent improvement would be in time secured, and normal peristalsis established.

ADDITIONAL FORMULÆ.

Cascara mixture for habitual constipation.

℞ Extracti cascaræ sagradæ liquid., 2 oz.
Tincturæ nucis vomicæ, 3 drs.
Tincturæ belladonnæ, 3 drs.
Glycerini ad 4 oz.

M. f. mist. A teaspoonful night and morning for four days, then only at night. (*Whitla.*)

Another.

℞ Extr. cascaræ liq., 5 drams.
Tinct. nucis vom., ½ dram.
Aquæ laurocerasi, ½ oz.
Syrupi simp., ½ oz.
Aquæ ad 5 oz.

M. f. mist. Three or four teaspoonfuls in the day. (*Dujardin-Beaumetz.*)

Aloes and iron pills for obstinate constipation.

℞ Extracti aloes aquosi, 1 gr.
Ferri sulphatis, 2 grains.

M. et ft. pil. One to be taken three times a day after each meal for a week, then one twice a day for a fortnight, then one every night. (*Spender.*)

Dinner pills.

The following formulæ are Prof. Whitla's:—

℞ Extracti aloes Socotrinæ, ½ gr.
Extracti nucis vomicæ, ½ gr.
Pulv. ipecacuanhæ, ½ grain.
Pulv. capsici, 1 grain.

M. f. pil. To be taken daily after dinner.

℞ Pilulæ colocynthidis co., 25 grains.
Ferri arseniatis, 1 grain.
Extr. belladonnæ, 8 grains.

M. et divide in pil. 20. One after dinner.

For constipation in very young infants.

℞ Mannite, 150 grains.
Hot water, 1½ oz.

M. f. mist. A dessertspoonful every hour until it acts. (*Monti.*)

For infants with rickets and intestinal atrophy.

℞ Ol. morrhuæ, 2½ drams.
Syrupi simpl., 2½ drams.
Mucilag. acaciæ ad 3 oz.

M. f. mist. A dessertspoonful three times a day. (*Monti.*)

Constipation in scrofulous children may be overcome by

Sodii phosphatis, 10 to 20 grains, in milk daily. (*Chrystie.*)

In rachitis and scrofula.

℞ Tinct. nucis vomicæ, ½ dram.
Extr. cascaræ sagradæ fl., 6 drams.
Tinct. gentianæ comp., 7 drams.

M. Two drops in a teaspoonful of water three times daily, one hour after meals. (*Chrystie.*)

Powders for constipation.

Calcined magnesia, 6 drams.
Cream of tartar, 3 drams.
Bicarbonate of soda, ½ dram.
Sugar flavoured with oil of aniseed, 15 grains.

To be divided into 40 cachets. One before each meal. (*Huchard.*)

Pills for constipation.

℞ Aloinæ, ½ grain.
Ext. nucis vom., ½ grain.
Ferri sulph., ½ grain.
Pulv. myrrhæ, ½ grain.
Saponis, ½ grain.
M. f. pil.

If fæces are dry add—

Ipecac. pulv., ½ grain.

If the pill gripes add—

Ext. belladonnæ, ½ grain.

One, or just as much of one as suffices to procure a natural action next morning, to be taken half an hour before the last meal of the day. As an alternative, 5 to 20 drops of fluid extract of *cascara sagrada* in an ounce of water may be taken at bed-time, or before dinner; or both failing to agree 2 or 3 grains each of dried carbonate of soda and powdered rhubarb may be taken before the mid-day meal. (*Clark.*)

Podophyllin pills for chronic constipation.

℞ Podophylli resinæ, 1 grain.
Extracti aloes aquosi, 10 grs.
Extracti rhei, 10 grains.
Extracti taraxaci, 15 grains.

M. et divide in pil. 10. One, two, or three at bed-time. (*Nothnagel.*)

Compound sulphur lozenges for habitual constipation.

Each lozenge contains:—

Precipitated sulphur, 5 grs.
Cream of tartar, 1 grain.
(*Sir A. Garrod.*)

Iridin and aloes pills for constipation of the gouty.

℞ Iridin, 24 grains.
Aloes pulv., 18 grains.
Extr. hyoscyami, 6 grains.

M. et divide in pil. 12. One at bed-time, to be followed by a glass of Carlsbad water the following morning.

In constipation from muscular torpor of intestine.

℞ Extr. physostigmatis, 5 grs.
Extr. belladonnæ, 5 grs.
Extr. nucis vomicæ, 5 grs.

M. et divide in pil. 10. One at bed-time. (*Bartholow.*)

Pills for habitual constipation.

℞ Quininæ sulphatis, 15 grains.
Extracti aloes aquosi, 30 grs.
Pulv. glycyrrhizæ, q.s.

Ut f. pil. 60. Take three pills night and morning.

Or

℞ Podophylli resinæ, 4 grains.
Extr. belladonnæ, 2 grains.
Extr. gentianæ, q.s.
Pulv. menyanthis, q.s.

Ut f. pil. 25. One to three pills in the morning.

Or

(in more obstinate cases)

℞ Pulv. rhei, 30 grs.
Extr. aloes aquosi, 30 grs.
Extr. colocynthidis, 3 grains.
Mellis, q.s.

Ut f. pil. 20. Two to four daily. (*Bamberger.*)

CHAPTER X.

DISEASES OF THE INTESTINE: THE TREATMENT OF DIARRHŒA, INTESTINAL CATARRH, ACUTE AND CHRONIC.

Diarrhœa a Disease as well as a Symptom—An Inflammatory and a Non-Inflammatory Form. *Causes* of Acute and Chronic Diarrhœa: Local Irritation from offending Ingesta—Influence of Cold—Secondary to Organic or Constitutional Disease—Endemic or Epidemic in Hot Weather, and probably Microbic and Specific—Sometimes Eliminative of Toxic Substances in the Blood—Infancy predisposes to Intestinal Catarrh—*Other Symptoms* of Acute Intestinal Catarrh. *Treatment:* (1) Of *Acute Diarrhœa*—Diet—Milk—Farinaceous Foods—Food for Chronic Cases—Raw and pounded Meat—Rest, general and local—Medicinal Treatment—Eliminative—Enemata—Castor Oil—Calomel—Use of Alkalies—Opium—Formulæ for Infants—Astringents—Salts of Bismuth—Chalk—Tannin—Intestinal Antiseptics—Sterilised Milk—Calomel—Salol—Resorcin, etc. etc.—β-Naphthol—Lactic Acid—(2) Of *Chronic Diarrhœa*—Quinine in *Malarial* Cases—Milk and Vichy Water—Peptones—Mineral Astringents—Kissingen Water—Intestinal Irrigations. Additional Formulæ.

It has been said that **diarrhœa** is a symptom and not a disease, and that the disease of which it is a symptom is *inflammation of the intestinal mucous membrane*, or *intestinal catarrh*. From the point of view of treatment this question is not, perhaps, of much importance, and we may regard diarrhœa both as a symptom and a disease. Certainly there are forms of diarrhœa which are not inflammatory, and cannot be rightly considered as dependent on *inflammation* of the intestinal mucous membrane, and in which this symptom is of almost sole importance, and it may, therefore, be justly regarded as a functional disease.

In this chapter we shall regard *diarrhœa* as often dependent on acute and chronic intestinal catarrh, especially when the catarrhal condition is general, and affects a large extent of mucous membrane; but as occurring also in other states which are chiefly characterised by a morbid flux from the bowels.

We consider, then, that there is justification for the division of diarrhœa into inflammatory and non-inflammatory. The latter including those cases of emotional origin, or nervous diarrhœa, analogous to the polyuria of a hysterical attack, and those of mere exaggeration of physiological function, habitual in some persons, and in many instances dependent on any slight excess in the *quantity* of the ingesta. In these cases, too, the matters discharged are ordinary fæcal matters simply in an unduly liquid state. In cases of diarrhœa dependent on inflammatory catarrh of the intestine the flux from the bowel consists in part of inflammatory exudation from the catarrhal mucous membrane, in part of intestinal secretions hurried onwards by the exaggerated peristalsis attendant on the inflammation, and in part of unabsorbed partially or wholly undigested food. In chronic diarrhœa, due to chronic intestinal catarrh, abundant *muco-purulent* secretion may be present in the discharges.

With these few preliminary remarks we may pass on to the consideration of the **causes** of acute and chronic diarrhœa.

We must bear in mind that the intestinal mucous membrane is particularly liable to catarrhal inflammation, and that comparatively slight irritation is sufficient to excite it, especially in certain individuals in whom the intestinal mucous membrane is peculiarly sensitive.

1. The most common cause of intestinal hyperæmia, catarrh and diarrhœa is **local irritation,** and the most usual local irritant is some offending ingesta. A variety of food substances will, under certain conditions, excite diarrhœa, either substances unsuitable in quality, *i.e.* in themselves indigestible, and acting as irritating foreign bodies, or substances in a state of commencing decomposition, and capable of acting as chemical irritants, or simply food too copious in quantity, or badly prepared. The pouring out of an excess of bile, or bile of an abnormal quality may act in the

same way; on the other hand, an absence of bile, from inflammatory closure of the common duct, may also lead to diarrhœa, for in the absence of the alkaline bile, which usually neutralises the acidity of the chyme as it passes out of the stomach, the contents of the small intestine remain acid, and, therefore, act as an irritant, and set up an intestinal catarrh from the lack of bile. The loose motions are in such cases found to be white, or clay-coloured, and often very offensive, as a due admixture with bile also prevents the formation of irritating products of putrefaction by its known antiseptic action.

Long-retained indurated fæces (intestinal concretions) may set up catarrhal inflammation of the intestine, not only by *mechanical* irritation, but also by the toxic substances developed by the putrefactive changes they undergo.

2. The *influence* of **cold** is now recognised to be a much more common cause of intestinal catarrh than it used to be. It is difficult to believe that this acts, as suggested by Leube, through "driving the suddenly cooled blood upon the surface of the body into the intestines, where the irritation excites increased peristalsis and inflammation;"* it seems far more likely that the catarrh so caused is dependent either on a reflex vaso-motor influence arising through the cutaneous nerves, or that it is dependent on arrested cutaneous secretion causing the retention in the blood of substances irritating to the intestinal mucous membrane, and is, therefore, analogous to the inflammation of the duodenum observed to follow extensive surface burns.

3. The intestinal catarrh may be **secondary**, and due to a morbid state of the intestinal mucous membrane, which may itself be caused by some other organic or constitutional disease—*e.g.* obstruction to the circulation through the liver or in the portal vein causing venous hyperæmia of the intestine, or a more

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* Von Ziemssen's "Cyclopædia of Practical Medicine," vol. vii. p. 364.

general and more permanent venous congestion dependent on chronic pulmonary and cardiac disease. It will be readily understood how easily a diarrhœa may be excited in these morbid hyperæmic conditions of the intestinal mucous membrane by any slight irritation. Such hyperæmic states may, however, exist without diarrhœa. Lardaceous degeneration, ulceration of the mucous membrane, tuberculous, cancerous, dysenteric, or typhoid, do not directly concern us now as they will be dealt with in other chapters, but they also are well-known causes of diarrhœa.

4. Many instances of **endemic** or **epidemic** diarrhœa, such as are especially prone to occur in hot weather, are probably of **microbic** origin; and the elevation of temperature, which has been regarded as a cause of diarrhœa, may only act by calling the infective organisms into activity, or by promoting the activity of putrefactive processes in foods and beverages. Under this heading we should group those cases which occur after drinking water from suspected sources, and probably contaminated with sewage matters, and those associated with *malarial* infection. The *green* diarrhœa of infants has been shown to be of microbic origin by Professor Hayem.*

5. Some attacks of diarrhœa are **eliminative** and are excited by the presence of toxic substances in the blood, as in uræmia, etc.

6. Infancy seems to be a predisposing cause of intestinal catarrh, which is very common in nursing children. This is due not only to the extreme sensitiveness of their intestinal mucous membrane, but also to the frequent absence of that extreme care and cleanliness which are needed in the selection and preparation of their food in order to avoid exciting gastro-intestinal irritation. The too early recourse to farinaceous foods is especially responsible for much of the gastro-intestinal disorders of infancy.

Diarrhœa is often the only **symptom** of *acute* intestinal catarrh, but at other times attacks of pain and colic precede and are relieved by evacuations from the bowels. Some flatulent distension of the abdomen and tenderness on pressure are also common. Fever is present in some cases, especially in those caused by chill. Thirst is generally complained of in acute diarrhœa owing to the considerable loss of water from the blood.

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* Académie de Médecine, Paris, May 14, 1887.

One of the chief points in the **treatment** of diarrhœa, whether **acute** or chronic, is a suitable regulation of the diet, and when the diarrhœa has been caused by faulty feeding, this will often alone effect a cure. There is one general rule which applies to all cases of diarrhœa, and that is the avoidance of all foods which leave much indigestible residue, and that may, therefore, tend to maintain irritation of the intestinal mucous membrane. Only such foods should be prescribed as leave a bland and unirritating residue as a result of their digestion, and have no tendency to undergo decomposition into irritating acid substances in the intestine.

It is scarcely necessary to point out that all green vegetables, most fruits, nuts, brown bread, all fat, rich or acid dishes, all forms of animal food that are hard or tough and, therefore, difficult of digestion, should be avoided.

In cases in which milk is readily and easily digested it is one of the best foods. It should be first boiled, and given diluted with water, or lime water, or soda water. In cases in which milk is not easily digested, and when we find the curd of milk passed in the motions, we must prescribe unirritating farinaceous foods—arrowroot, sago, tapioca, or ground rice, prepared with water and flavoured with some aromatic spices, such as cloves, cinnamon, or nutmeg.

Egg albumen has been found an excellent food for children with diarrhœa, when milk disagrees. The white of one or two eggs should be whipped up with half a pint of water, a little salt added, and a few drops of brandy. This may be given freely.

Many cases of acute diarrhœa may be quickly cured by limiting the food, for a day or two, to water-arrowroot, flavoured with a little port wine or cognac. Beef-tea and clear soup, when these are preferred (or as a variety), may be given, *thickened* with arrowroot, sago, or tapioca.

The best beverage is soda water and milk, with a small quantity of brandy, iced if there is much thirst and fever. Port wine and water may be given if preferred.

On the subsidence of the acute attack a gradual return to ordinary diet may be permitted. For a few days, however, we should restrict the patient to clear soup, or beef-tea, or mutton or veal broth, thickened with a little crumb of stale bread, tapioca, or sago. Boiled chicken, pheasant, or partridge, with rice, may be permitted, or some boiled or grilled whiting or sole and a little mashed potato. A little weak brandy and water or port wine and water may be allowed as a beverage.

The dietetic treatment of **chronic diarrhœa** is of no less importance, but it is difficult to carry out owing to the impatience of most persons of the continued restraint which a suitable dietary implies.

The general principle to be borne in mind is that the food should be concentrated and small in bulk, easy of digestion in the stomach, and leaving but little residue to irritate the intestinal mucous membrane in its passage along it. Solid food or food leaving a solid residue after digestion should not be given more than once or twice in the twenty-four hours.

A strictly milk diet—unless in the exceptional cases in which milk does not agree—is the best. The milk should be boiled, and diluted with some alkaline water such as Vichy or Apollinaris. Six ounces of milk with 2 ounces of Apollinaris water may be taken at first every three hours, and afterwards every two hours, if well borne. Peptonised milk or other predigested foods may be used in those cases in which ordinary milk is not well borne.

Some French physicians strongly advocate the use of raw meat in the treatment of chronic diarrhœa. This may be combined with the milk diet, if desired An ounce of the lean of beef or mutton, thoroughly separated from all fat or fibrous tissue, is scraped or pounded to a pulp, and mixed with powdered sugar or currant jelly, or with a little thin tapioca or weak wine (port) and water, and taken twice or three times a day. Or if this is objected to, some finely minced underdone meat may be mixed with milk and water or wine and water. We should begin with quite small quantities, and these can be increased if the diet is well borne. If the diarrhœa ceases with this plan of feeding we should return gradually to the ordinary articles of diet, selecting, of course, those which are most easily digested, and taking care to avoid too copious a dietary.

In treating the chronic diarrhœa of infants and young children the greatest care must be given to their feeding. Minute investigation must be made into every detail as to the kind of food given, and its mode of preparation. It will constantly be found that some important physiological consideration has been overlooked or some error in the preparation of the food committed, or some form of food is being given persistently which causes irritation, and which requires to be suppressed or changed.*

If the *diarrhœa* has been caused by chill, rest in bed will be needed, as, indeed, in all severe acute cases, and as a prophylactic an abdominal belt of flannel, or flannel underclothing, should be worn.

The **medicinal treatment** of diarrhœa must be adapted to the circumstances in which it has occurred. When it is clearly traceable to the presence in the alimentary canal of irritating ingesta or retained excrementitious substances we should aid this effort of Nature to eliminate them. If from examination (percussion, etc.) of the colon we have reason to think indurated fæces are retained there, or if small scybalæ are seen floating on the fluid stools, or if obstinate constipation has preceded the attack, copious enemata of warm soap and water, with or without a tablespoonful or two of castor oil, usually succeed in evacuating such accumulations as are in the large intestine. If, on the other hand, the irritating substances appear to be still in the small intestine, as is usually the case when severe colicky pains are complained of, it is advisable to give a mild but efficient cathartic; a dose of 2 or 3 grains of calomel has the advantage of being tasteless and well borne even by an irritable stomach, and it is usually effectual; or a small dose of castor oil, and best in the form of an emulsion, may be given.

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* For further detailed considerations on infant feeding refer to the author's work on "Food in Health and Disease," chapter xi. part i.

℞	Ol. ricini	6 drams.
	Pulv. tragac. co.	1 "
	Syrupi	4 "
	Aquæ carui	ad 3 oz.

M. f. mist. A tablespoonful every hour or two until relieved. A smaller dose must be given to very young children —one or two teaspoonfuls, according to age.

Gregory's powder (*pulvis rhei compositus*) is also an excellent medicine for children for these attacks in doses of 5 to 20 grains. A dose or two of this kind, with proper attention to diet, will usually succeed in curing cases of acute diarrhœa, dependent on the presence of irritating substances in the intestine.

But many of the commonest forms of diarrhœa seem to depend on an unduly **acid** condition of the intestinal contents, possibly due to the absence of sufficient alkaline bile in the small intestine; at any rate, they are easily cured by alkaline medicines without the use of any direct astringents. In such cases you do not give medicine for the purpose of immediately arresting the flux from the bowels, but for the purpose of preventing its continuance. A few doses of the following mixture, limiting the food at the same time to water-arrowroot, with a little brandy, will quickly cure many of the slighter forms of acute diarrhœa:—

℞ Sodii bicarb.	60 grains.
Spir. ammoniæ aromat.	3 drams.
Tinct. cardamomi comp.	6 ,,
Aquæ cinnamomi	ad 6 oz.

M. f. mist. Two tablespoonfuls to be taken every two or three hours until relieved.

There is a distinct advantage in curing a diarrhœa by such simple means, rather than by the use of astringents and opiates, as the latter interfere with the action of the liver, and are apt in some persons to be followed by loss of appetite, constipation, headache, and other discomforts.

But many cases of acute diarrhœa cannot be arrested by such simple means, and we are obliged to have recourse to remedies which exercise a more direct influence over the catarrhal mucous membrane.

There are many such at our disposal, but there are none so immediately and strikingly successful as **opium.** This drug has a most remarkable influence over the circulation in mucous membranes in most persons. It has also the property of relieving pain and spasm, and when these accompany an acute attack of diarrhœa it will rarely be wise to withhold a dose or two of this drug.

A small pill of ½ a grain of extract of opium may be given with each of the two or three first doses of the mixture we have just described, when something more efficient is needed to relieve suffering and arrest the catarrhal flux. Young children do not tolerate opium well, except in very small doses, and yet they, perhaps more than adults, need opium to allay the hyper-sensitiveness of the inflamed mucous membrane.

If there seems any good reason why opium should not be given internally, it may be applied in the form of the *linimentum opii*, externally, on hot flannels or on cotton wool, or sprinkled on a linseed-meal poultice. Such warm opiate applications are most useful in relieving pain.

There are several preparations in the *Pharmacopœia* which enable us to give opium in sufficiently small doses even to very young children. One of the best of these is the *pulvis kino compositus.* One grain of this powder contains only $\frac{1}{20}$th of a grain of opium, and this dose may be given to a child of the age of three months. Great care must, of course, be observed in repeating the dose, and it should not be left to a nurse but to a medical man to determine this. The following is a useful formula:—

℞ Pulv. kino compositi	4 grains.
Pulv. cretæ aromatici	16 ,,
Sodii bicarb.	8 ,,

Mix and divide into four powders. A powder to be given in a teaspoonful of water-arrowroot every three or four hours until relieved. In very young infants, under three months, a half of one of these powders, equal to one-fortieth of a grain of opium, may be given.

A safe and useful plan of giving small doses of opium in order to arrest infantile diarrhœa and to relieve the pain and restlessness attending it is by means of small enemata. A tablespoonful of the following mixture should be shaken up with an ounce of thin warm starch, and injected into the bowel:—

℞ Pulv. ipecac. comp. (Dover's powder)	4 grains.
Acidi tannici	12 ,,
Mucilaginis acaciæ	2 oz.

M. f. enema. A tablespoonful for each injection.

As there is $\frac{1}{10}$th of a grain of opium in each grain of Dover's powder, and as given in this way the opium is very slowly and gradually absorbed, it forms a perfectly safe method of administering opium to young children; but unless the diarrhœa is at once arrested much of the enema will be discharged with the next loose motion, and it may, therefore, require to be soon repeated. A larger dose—2 to 3 grains of Dover's powder—may be given to older children (five years and upwards) by this means.

In adults, if there is much gastric irritability as well as intestinal pain and spasm, relief may be almost immediately obtained by the hypodermic injection of $\frac{1}{6}$th or $\frac{1}{4}$th of a grain of the sulphate or hydrochlorate of morphine.

In severe, protracted, or recurrent forms of acute diarrhœa, as well as in the chronic cases, it may be needful to have recourse to the **direct astringents**, of which there are many, or to one or other of these in combination with opium.

The preparations of **bismuth** enjoy, and justly, a great reputation in the treatment of intestinal catarrh; the carbonate, the subnitrate, and the oxychloride (preferred by many) are all efficacious, and the salicylate has, recently, been largely used on account of its antiseptic properties; but it is probable that all these preparations of bismuth act to some extent as antiseptics. The *salicylate* should be chosen in the case of infectious or putrid diarrhœa, or when the evacuations are very offensive.

These preparations of bismuth are tasteless, and can, therefore, be easily given to children. They probably act to some extent locally, by affording a protective covering to the inflamed mucous membrane. They further absorb sulphuretted hydrogen, which may be a part of their curative action, and are eliminated in the form of *black* sulphides. The subnitrate not only acts as an inert powder and as an absorbent of gases, but it has also marked antacid properties. It is a very basic salt, and is thus enabled to neutralise the excessive acidity of the intestinal contents. It is often advantageous to mix bismuth with prepared chalk, which also has both antacid and absorbent properties. The following formula for bismuth and chalk in powders is suitable for children:

℞ Bismuthi subnitratis	30 grains.
Cretæ preparatæ	18 ,,
Sodii bicarb.	12 ,,
Pulv. tragacanth comp.	20 ,,

Mix and divide into six powders. A powder in a dessert-spoonful of thin arrowroot every three or four hours. Half this dose may be given to infants and very young children, and twice the dose to full-grown children.

For adults the following mixture may be prescribed :—

℞ Bismuthi oxychloridi	80 grains.
Pulv. cretæ aromatici	160 ,,
Sodii bicarb.	40 ,,
Spir. ammoniæ aromat.	4 drams.
Mucilaginis tragacanthæ	2 oz.
Aquæ chloroformi	2 ,,
Aquæ cinnamomi	ad 8 ,,

M. f. mist. Two tablespoonfuls every two or three hours.

The addition to this mixture of 20 minims of liquor opii sedativus makes a valuable combination for the relief of intestinal pain and irritation as well as of diarrhœa.

Tannin and the various vegetable astringents containing it, such as catechu, rhatany, kino, hæmatoxylum, are valuable remedies in the treatment of acute and chronic diarrhœa. They are usually used in combination with antacids, bismuth, opium, etc.

Tannin is most useful for administration in enemata, and, as we have already said, a small enema of 1 to 3 ounces of warm thin starch containing 5 to 20 grains of tannin and 1 to 10 grains of Dover's powder, according to the age of the patient, is very efficacious in arresting severe forms of acute diarrhœa.

A useful prescription for an attack of diarrhœa which is tending to become chronic, and which appears to be maintained by a certain amount of loss of tone in the intestinal mucous membrane, is the following :—

℞ Tincturæ catechu	4 drams.
Sodii bicarb.	80 grains.
Spir. ammoniæ aromat.	4 drams.
Tinct. nucis vomicæ	80 minims.
Infusi calumbæ	ad 8 oz.

M. f. mist. Two tablespoonfuls three times a day an hour before taking food.

In other cases a better effect will be obtained by giving doses of 10 or 15 minims of *dilute sulphuric* *acid* in the above mixture in the place of the soda and ammonia.

We have found some troublesome forms of diarrhœa (especially those of phthisis and also some neurotic forms) more amenable to the *tincture of coto bark* or its alkaloid *cotoin* than to any other remedy. If the tincture is used it requires to be *mixed carefully*, or much of its resinous principle will be deposited and lost. A dram of the tincture should be mixed with 4 drams of compound tincture of chloroform, and this rubbed down with 1½ ounce of mucilage, and then diluted with 4½ ounces of carraway water. A tablespoonful of this mixture may be given to an adult every three or four hours and one or two teaspoonfuls to a child.

Attention has recently been directed to the use and efficiency of certain **intestinal antiseptics** in the treatment of some forms of acute diarrhœa (enteritis and entero-colitis) of supposed microbic origin, especially in young children.

The interesting researches of Escherich, Vignal, Brieger, A. Gautier and others have thrown much light on the action of the numerous forms of micro-organisms found in the alimentary canal. There are no microbes to be found in the intestinal canal of the new-born infant, but they begin to appear there soon after birth, entering, no doubt, by the mouth from the surrounding air. If the child is fed by other than its mother's milk (unless the milk used is sterilised) microbes may also enter the alimentary canal in its food. At any rate, an immense number of micro-organisms are found in the alimentary canal of an infant a few days old. Some of these microbes may actually take part in the physiological processes of assimilation; others may, under normal conditions, be quite inoffensive and indifferent, the substances they contribute to form, although toxic in large quantity, are in the minute quantities produced readily eliminated, and prove harmless. Amongst these are various organic acids, sulphuretted and carburetted hydrogen, ammonia, leucine, tyrosine, indol, scutol, and, above all, certain poisonous alkaloids known as **ptomaines.** But if from the prevalence of certain conditions, such as the occurrence of great heat and moisture, or the production of some abnormal change in the chemical reactions of digestion, the contents of the stomach and intestines become transformed into a medium particularly favourable to the culture and multiplication of these microbes, if they encounter putrescent substances in abundance, the toxic substances already mentioned are developed in such increased quantities that they cannot be eliminated with sufficient rapidity by the excretory organs, and toxic symptoms make their appearance, *diarrhœa* being the most frequent of these. This symptom seems to be excited especially by the *organic acids* and the *alkaloids* formed by microbic action. The simplest and commonest forms of diarrhœa are probably provoked by the irritant action of these *acids* on the intestinal mucous membrane, and the graver forms, notable for the suddenness, violence, and seriousness of the attack, are probably due to the poisonous effects of animal alkaloids.

It is clear from these considerations that the rational treatment of such forms of diarrhœa must involve the adoption of means (both alimentary and medicinal) to promote intestinal antisepsis. All food must be rejected that may add to the number of microbes in the intestinal canal or favour their multiplication. There are no microbes in milk sucked from the nurse's breast, so that the transferring of a hand-fed infant to a wet nurse is an antiseptic measure. Sterilising the milk used for feeding an infant is another antiseptic proceeding. To sterilise milk completely is not a very easy process.

Whitla says, "It can be best sterilised by being boiled upon a water-bath in small bottles for fifteen minutes." The bottles should, however, be plugged with sterilised cotton-wool, which should not be removed until the milk is to be consumed. Whitla has all tubes and bottles soaked in a saturated solution of boric acid, and a few grains added to each pint of milk as it comes from the cow in summer weather.

One of the simplest medicinal measures for the promotion of intestinal antisepsis is a *purge* which carries away the undigested and fermenting products of a faulty alimentation, as well as the microbes with which they swarm. In **calomel** we have a medicine which is both purgative and antiseptic, and hence its great value and success in the treatment of infantile diarrhœa of a choleriform type when administered at the onset of the attack. The dose to be given must depend on the age of the child, but small doses frequently repeated are the best, ¼ grain every hour for five or six doses, mixed with ½ grain of sugar of milk, and thrown on the child's tongue, is a good way of giving it. Some physicians give from 1 to 4 grains at a dose.

Salol has been warmly advocated as an intestinal antiseptic in these cases, and especially by Dr. Moncorvo of Rio, in the treatment of the acute diarrhœa or enteritis of children, of malarial origin. Soon after commencing its use the diarrhœa lessens and disappears, the stools lose their fœtid odour, and the vomiting and the flatulent colicky pains cease. It is perfectly innocuous even to the youngest infants.

The doses he has employed have varied, according to the age of the child and the severity of the attack, from 2 to 30 grains in the twenty-four hours. It has been estimated that a child of 6 months should take ½ grain every two hours; one of 2 years, 2 grains; and one of 5 years, 3 grains. It may be best given to children suspended in a mixture with a little mucilage and syrup.

Dujardin-Beaumetz suggests the following formula for adults, and in chronic cases :—

℞ Salol ... ... }
Bismuthi salicylatis ... ... } āā 150 grains.
Sodii bicarbonatis ... ... }

Mix and divide in pulv. (or cachets) 30.

One to be taken before food twice or three times a day. Many other substances have been suggested as intestinal antiseptics and for the treatment of these forms of diarrhœa.

Resorcin has had many advocates. It may be given in doses of $1\frac{1}{2}$ to 5 grains in a mixture, or in form of powder, according to the following formulæ :—

℞ Resorcin	12 grains.
Glycerini	4 drams.
Tinct. opii	16 minims.
Aquæ cinnamomi	ad 4 oz.

M. f. mist. Dose, one tablespoonful for an adult, one or two teaspoonfuls for a child.

Or :—

℞ Resorcin	12 grains.
Bismuthi carbonatis	30 ,,
Pulv. ipecac. comp. (Dover's powder)	6 ,,

Mix and divide into six powders. A powder every four hours. For children over five years of age.

Creasote, carbolic acid, creoline, naphthaline, thymol, salicylate and benzoate of soda, nitrate of silver, hydrochloric acid and pepsin tincture of iodine, have all had their advocates for this purpose.

β-Naphthol and hydronaphthol, in doses of 1 to 2 grains every two to six hours, have been found very useful as intestinal antiseptics in various forms of diarrhœa ; the green diarrhœa of infants, the diarrhœa of typhoid and tubercular disease, and in the common forms in adults.

Copious enemata of warm water mixed with 10 per cent. of alcohol or $\frac{1}{3}$ per cent. of salicylic acid or creolin water ($\frac{1}{4}$ to $\frac{1}{2}$ per cent.) are of use when we wish to exercise an antiseptic action on the large intestine.

The researches of Professor Hayem into the nature of the so-called "green diarrhœa" of infants has led to the introduction of **lactic acid** as a remedy for this and other forms of diarrhœa. The presence of a special bacillus in these cases has been demonstrated by him, and when isolated and cultivated it has been found to produce the green matter by a sort of process of excretion. Hayem observed that the vomited matters and the stools in these cases were either neutral or alkaline, and this led him to the discovery that this bacillus could not live in an acid medium. Hydrochloric acid he found a good remedy, but its action was uncertain, and he was led to try the effect of lactic acid. He gave a teaspoonful of a 2 per cent. solution to the infant a quarter of an hour after each suckling—from 5 to 8 teaspoonfuls in twenty-four hours. The vomiting, if present, soon ceased, the motions lost their *green* colour and became yellowish, and in a short time became normal in appearance and frequency. It was necessary to disinfect the vomited substances, the motions, and the soiled linen by treating them with a solution of corrosive sublimate.

M. Hayem considers this form of diarrhœa is spread by contagion, and that the agents of infection are the germs deposited on the linen soiled by the motions. Although lactic acid given by the mouth is largely absorbed in the stomach in the form of lactates, yet given in sufficiently large doses it can, in part, be found in the diarrhœic evacuations, and it can, therefore, exert its topical and germicide action in the intestine.

Hayem prescribes lactic acid as a drink in the following form :—

℞ Acid. lactic.	2½ to 4 drams.
Syrupi simp.	6 oz.
Aquæ	24 ,,

To be drunk between meals.

He recommends it in the diarrhœa of typhoid, and of the tuberculous, and in the chronic diarrhœa of persons with defective acidity of the gastric juices, and he believes it may be found both curative and preventive in epidemic cholera.

The **chronic** forms of diarrhœa are generally those which have resisted the treatment usually applied during the acute stage, or those which are acquired in tropical countries, or those which depend on some constitutional tendency to chronic intestinal flux, or to excessive peristalsis unduly hurrying the food through the intestinal canal.

These cases are often difficult of cure, and tax all our therapeutic resources. We have already pointed out the necessity for a searching examination into the food habits of such patients, and the necessary dietetic prescriptions to be enforced. It is also, of course, extremely important to ascertain that the diarrhœa is not dependent on the existence of organic disease.

Cases of malarial origin have been rapidly cured by the administration of quinine; it is necessary, therefore, not to overlook such a possible origin of the disease.

In some forms of chronic diarrhœa in *hysterical* women a prolonged *rest-cure* is the best remedy. If it should be due to increased and abnormal peristalsis, the bromides may prove useful.

The cases of chronic diarrhœa which originate amongst Europeans in tropical countries are best treated by dietetic measures. Dujardin-Beaumetz has found the only efficacious treatment to consist in restricting the patient to a diet of milk mixed with Vichy water. Dr. Feris, however, who is quoted by Dujardin-Beaumetz, has found it better to treat them with *solid peptones*, from 3 to 6 tablespoonfuls a day, allowing at the same time 2 pints of milk daily.

In chronic diarrhœa *bismuth* and the vegetable astringents already mentioned, with or without opium, will usually have been tried, and have failed to do more than procure temporary relief. In such cases we sometimes find the stronger mineral astringents will succeed better, such as oxide of zinc, acetate of lead, sulphate of copper, nitrate of silver or pernitrate of iron, perchloride of iron, etc.

The *oxide of zinc* may be given in 5- to 10-grain doses in pills combined with a little chalk and opium, as follows :—

℞ Zinci oxidi	7 grains.
Cretæ preparatæ	*2 ,,
Extracti opii	$\frac{1}{4}$,,
Mucilaginis	q.s.

Ut f. pil. 2. To be taken three or four times a day.

The *acetate of lead* is a very effectual astringent in chronic diarrhœa, but being itself a poison, it is not usually resorted to until other more simple remedies have failed; it is not a remedy that should be given for long periods at a time. It is best given in the form of a pill combined with opium :—

℞ Plumbi acetatis	2 grains.
Extracti opii	$\frac{1}{2}$,,

M. f. pil. To be taken three times a day.

Sulphate of copper is a still more effectual remedy for chronic diarrhœa; like the preceding, it is usual to combine it with opium. *Small* doses only must be given, at first, on account of its irritating effect on the stomach.

℞ Cupri sulphatis	2 grains.
Pulv. cinnamomi	12 ,,
Pulv. opii	3 ,,
Mucilaginis	q.s.

Ut f. pil. 12. One pill, which may be increased to two, to be taken three times a day.

Nitrate of silver also may be given, in troublesome cases, in doses of $\frac{1}{4}$ or $\frac{1}{3}$ of a grain in a pill with the same quantity of extract of opium. These astringent salts should be given when the stomach is empty; they may then probably pass into the intestine and exercise a favourable influence on ulcerative processes there which may possibly be keeping up the irritation and preventing a cure.

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* This is added to avoid the possibility of some chloride of zinc being formed by the acid of the gastric juice.

The *pernitrate of iron* has been found useful in forms of chronic diarrhœa associated with defective tone and general anæmia. The following mixture may be prescribed :—

℞ Liquor. ferri pernitratis	20 minims.
Liquor. strychninæ	2 ,,
Aquæ chloroformi	2 drams.
Infusi calumbæ ... ... ad	1 oz.

To be taken three times a day.

Small doses of Kissingen water have been found useful in the treatment of some forms of chronic diarrhœic intestinal catarrh. In small quantities, according to Leube,* it has a constipating rather than an aperient effect, and as it promotes gastric digestion, the chyme entering the intestine is in a condition more favourable for absorption.

Rectal or intestinal irrigations with cold water have been found to have a soothing and astringent effect in some forms of chronic diarrhœa, both in children and in adults. By means of a long tube, and by placing the patient in a suitable position, the water should be made to pass as high up as possible. Some astringent salt may be added to the water, such as alum, sulphate of zinc, or acetate of lead, in the proportion of 4 or 5 grains to the pint.

Many other drugs have been used by various physicians with advantage in the treatment of chronic diarrhœa, and as many cases are exceedingly obstinate and difficult of cure, and as it is impossible to have too many resources to choose from in combating this affection, we shall give examples of most of these in the additional formulæ.

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* Ziemssen's "Practical Medicine," vol. vii. p. 390.

ADDITIONAL FORMULÆ.

For acute diarrhœa of infants, and to check putrefactive changes in intestine.

℞ Hydrargyri biniodidi, $\frac{1}{50}$ gr.

Dissolve in sufficient iodide of potassium, and add chloral hydrate, 1 grain. (This dose may be given in a teaspoonful or two of dill-water.) (*Luff.*)

Creoline in the treatment of acute gastro-enteritis of infants.

℞ Creoline, 3 drops.
Syrup. althææ, 5 drams.
Aquæ canellæ ad 3 oz.

M. f. mist. A teaspoonful every hour for very young infants.

For older children.

℞ Creoline, 15 drops.
Sacchari albi, 2 drams.

M. et divide in pulv. 10. One or two daily. (*Schwinz.*)

Powder for infantile diarrhœa.

℞ Sodii bicarb., 4 grains.
Pulv. rhei, 1½ grain.
Pulv. cinnam., 1 grain.

M. f. pulv. To be taken twice a day. (*Whitla.*)

Kola in chronic diarrhœa.

Infusion (75 grains in a teacupful of water), or elixir, or tincture.

Dose, a dessert- or tablespoonful. (*Dujardin-Beaumetz.*)

Guarana in chronic diarrhœa.

20 to 40 grains daily. (*Shiron.*)

Cannabis indica in diarrhœa.

℞ Tinct. cannabis indicæ, 40 mins.
Spr. chloroformi, 40 mins.
Tinct. kino, 4 drams.
Aquæ menthæ pip. ad 4 oz.

M. f. mist. Dose, a teaspoonful to a tablespoonful.

Arsenite of copper in chronic diarrhœa.

℞ Cupri arsenitis, $\frac{1}{45}$ grain.
Aquæ, 5 to 15 drams.

M. A teaspoonful every fifteen to forty-five minutes until the diarrhœa ceases. (*Bentley.*)

Mixture for diarrhœa in children one to two years of age.

℞ Bismuthi carb., 45 grains.
Tinct. camphoræ comp., 1 dram.
Glycerini, ½ oz.
Mucilaginis, ½ oz.
Aquæ chloroformi ad 3 oz.

M. f. mist. A teaspoonful after each loose motion. (*Whitla.*)

After acute symptoms have subsided.

℞ Decoc. aloes comp., 1 dram (*infant*) to 1½ oz. (*adult*).

Every morning. (*Whitla.*)

Nitrate of silver injection in ulcerative colitis.

℞ Nitrate of silver, 30 to 60 gr.
Water, 2 to 4 pints.

Elevate the hips, and let the injection flow in slowly from a siphon-bag. (*Osler.*)

For diarrhœa in infants with milk curds in stools.

℞ Pulv. guaranæ, 15 grains.
Pulv. ipecac. comp., ¾ grain.
Pulv. sacchari alb., 45 grs.

M. et divide in pulv. 10. A powder every two or three hours. (*Monti.*)

(The dose may be doubled for older children.)

For profuse diarrhœa in infants without dyspepsia.

℞ Tinct. krameriæ, 30 mins.
Tinct. opii, 1½ minim.
Syrupi simp., 2½ drams.
Aquæ destill., 3 oz.

M. f. mist. A dessertspoonful every two hours. (*Monti.*)

Powders for chronic diarrhœa in infants with anæmia.

℞ Ferri carbonatis, 1½ grain.
Pulv. ipecac. comp., 1½ grain.
Pulv. sacchari, 45 grains.

M. et divide in pulv. 10. Three or four powders daily. (*Monti.*)

Salicylate of iron in the fœtid diarrhœa of infants.

℞ Ferri sulphatis, 20 grains.
Sodii salicylatis, 20 grains.
Glycerini, 3 oz.
Aquæ, 3 oz.

Dissolve the sulphate of iron and the salicylate of soda separately, and then mix. A tablespoonful every hour until the stools become blackened. (*Braithwaite.*)

Pepsin for tropical diarrhœa.

Half a pint of milk every three hours (no other food), and 5 grains of pepsin four times a day. Especially valuable in diarrhœa with copious, frothy stools, indicative of gastro-intestinal indigestion and fermentation. (*Young.*)

Pills for chronic diarrhœa.

℞ Extr. krameriæ, 30 grains.
Extr. monesiæ, 30 grains.
Pulv. calumbæ, 30 grains.
Pulv. ipecac. comp., 30 grns.
Olei anisi, 2 drops.

M. et divide in pil. 40. Six to ten to be taken daily. (*Huchard.*)

Mixture for chronic diarrhœa.

℞ Tincturæ catechu, 2 drams.
Tincturæ kino, 2 drams.
Tincturæ opii, 1 dram.
Spiritus camphoræ, 1½ dram.
Misturæ cretæ ad 3 oz.

M. f. mist. Two teaspoonfuls every four hours. (*Whitla.*)

For chronic diarrhœa with flatulence.

℞ Tinct. opii, 15 minims.
Extracti hæmatoxyli, 75 grs.
Syrupi cort. aurantii, 2½ drs.
Aquæ menthæ pip. ad 5 oz.

M. f. mist. A tablespoonful every two hours. (*Bamberger.*)

Pills for atonic diarrhœa.

℞ Acid. tannic., 30 grains.
Extracti opii, ¾ grain.
Extracti calumbæ, 30 grains.

M. et divide in pil. 20. One every three hours. (*Bamberger.*)

Powders for the same.

℞ Zinci sulphatis, 15 grains.
Opii pulv., 3 grains.
Sacchari albi, 2½ drams.

M. et divide in pulv. 20. A powder three times a day. (*Bamberger.*)

CHAPTER XI.

DISEASES OF THE INTESTINE—THE TREATMENT OF APPENDICITIS, TYPHLITIS, PERITYPHLITIS, AND OF DYSENTERY.

Lack of Clearness and Precision in the Definition and Description of Appendicitis, Typhlitis, and Perityphlitis—Attempt to correct this. Symptoms of Appendicitis—Treatment of Acute Cases—Symptoms and Treatment of more Chronic Forms—Of *Relapsing* and of *Suppurative* Forms. *Typhlitis, Cæcitis,* or *Colitis*—Symptoms—Indication for Treatment—Caution in use of Opium—Local Measures—Evacuants—Enemata—Salines—Calomel — Sodium Sulphate — Intestinal Antiseptics—Salol. *Chronic Colitis*—Treatment.

DYSENTERY—Etiology—A Specific Germ—Symptoms—Varieties—*Indications* for Treatment—Opium—Enemata to relieve Pain—Appropriate Food—Intestinal Antisepsis—Aperients—*Ipecacuanha*—Maclean's, Cunningham's, Dujardin-Beaumetz's and other Methods—Antiseptic Irrigation—Astringents—Quinine and Arsenic in Malarial Cases—Supporting Food and Tonics—Change of Climate—*Prophylaxis.* Additional Formulæ.

Appendicitis, typhlitis, perityphlitis.—In most text-books there is a lack of clearness and precision in treating of this subject. This is due to the prevailing method of beginning with a description of typhlitis and perityphlitis, and then referring the conditions described to appendicitis, which we are told gives rise to by far the greater number of the cases comprised under the two other headings. If it be so, surely it would be best to begin with a description of appendicitis, and then show in what respects typhlitis and perityphlitis may differ from this, if they have any independent existence, which some writers seem to doubt.

We shall attempt to avoid this confusion, as we believe it is calculated to lead to errors in treatment, and because we think it is not impossible to distinguish, with a certain amount of clearness and accuracy, the cases that appropriately fall under at least two of the three headings referred to.

1. By **appendicitis** we mean inflammation of the *vermiform appendix*, usually determined by the presence of some fæcal concretion, or foreign body, within it, which may lead by ulceration to perforation, and to the extension of the inflammation to the tissues surrounding the appendix.

In case of perforation a local suppurative peritonitis may be excited, limited by adhesions, and ending in the formation of an abscess which may point towards the surface. Or if perforation occur before adhesions have taken place, very serious general septic peritonitis will be aroused. Or the appendicitis may take a more chronic form, and appear as a series of relapsing attacks, and this tendency has led some to liken the appendix to an abdominal tonsil, prone like the tonsil, in some persons, to recurrent attacks of inflammation, which occasionally run on to suppuration.

2. By **typhlitis** or cæcitis we mean an inflammation, catarrhal or ulcerative, involving the coats of the cæcum, a consequence usually of the prolonged retention of indurated and irritating fæcal matter within it. This is a definite morbid state which need have nothing to do with *appendicitis*, and is, in some of its forms, a far less serious affection, requiring quite different treatment.

3. By **perityphlitis** we mean an inflammation of the structures around the cæcum. Some consider this term superfluous,* on the ground that the cæcum cannot be inflamed without the structures around it sharing in the inflammation; others restrict this term to inflammations which appear to begin in the surrounding tissues, although they may *extend* to the cæcum, and which are frequently caused by external injury.

It is evident, from its anatomical situation, that the local inflammation attending an attack of appendicitis may extend to the cæcum, and must extend to the tissues around, and it has been asserted that

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* Greig Smith's "Abdominal Surgery."

90 per cent. of the cases of perityphlitis are the result of disease of the vermiform appendix. But we must again remark that this is no reason for confounding together the two affections, although clinically they may be frequently associated. Maurin (quoted by Greig Smith) has shown that the cæcum is *alone* affected in a certain proportion of cases, and Greig Smith remarks * that "suppurative appendicitis is a perfectly distinct disease, having no more relation with the cæcum than with the ileum, bladder, or any other contiguous organ." And Gerhardt has taught that no pus is formed in 95 per cent. of cases of perityphlitis.

We have noted that those who refer all, or nearly all cases of perityphlitis, to disease of the appendix base their opinion on the records of hospital cases and of *post-mortem* examinations; but there are many cases of perityphlitis, which occur in private practice, that never see the inside of a hospital, nor are their own insides ever seen in a *post-mortem* room.

The **symptoms** of **appendicitis** and the treatment indicated will differ according to the acuteness and form of the attack. In the *most acute* form, when perforation occurs suddenly, the patient is seized with a sudden, severe pain in the iliac region, and this is rapidly succeeded by the signs of acute peritonitis, with a tendency to early collapse and death. The abdomen becomes distended, and exquisitely tender, the legs are drawn up, the respirations are hurried and wholly thoracic, there are usually vomiting and the other symptoms of acute suppurative peritonitis. In such a case there has been a sudden rupture of an ulcerated portion of the appendix before adhesions could take place, and an escape of fæcal matter into the peritoneum setting up a diffused suppurative peritonitis.

The **treatment** appropriate to such a case is the administration of opium to relieve pain, as in acute peritonitis; immediate abdominal section, before collapse sets in, followed by washing out and drainage of the abdominal cavity. Success can only be hoped for when operation is resorted to very early, as there is marked tendency to rapid collapse, and then operative interference would be useless.

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* "Abdominal Surgery," p. 761.

If the suggestion of operation is rejected, the treatment must consist in endeavouring to bring the patient quickly under the influence of opium, persevering with its administration as set forth in the directions for the treatment of acute peritonitis.

Sometimes perforation is not so sudden, and the patient may have complained for a few days, or even weeks, of vague pains in the right iliac region, with some symptoms of dyspepsia, flatulence, and constipation. There may be a rigor, an evening rise of temperature, loss of appetite, and thirst, then somewhat sudden symptoms of perforation may appear, from rupture of an abscess, which has formed round the appendix, and the discharge of its contents into the peritoneum. Such an untoward event has been even known to follow medical examination. The treatment of such a case is, of course, the same as the preceding.

But of the more common and chronic forms of appendicitis we may distinguish two groups—*first*, the cases of so-called relapsing appendicitis, with little tendency to suppuration; and *second*, those cases which lead to *localised* suppurative peritonitis, limited by adhesions, and caused usually by ulcerative perforation of the appendix.

The symptoms attending the first of these groups consist of recurrent attacks of pain in the right iliac fossa, days and even weeks of freedom from pain intervening between the attacks; and on local examination a tumour is often to be felt deep in the right iliac region, tender on pressure. The attacks may be accompanied by sickness, flatulent distension of the abdomen, and constipation. With rest in bed, or on a couch, opiate fomentations, or belladonna and opiate liniments applied locally, a diet restricted almost exclusively to fluids, and daily large enemata of warm soap and water with olive oil, to soften and bring away all fæcal accumulations without causing any irritation or excitement of the muscular coat of the bowel; with such careful expectant treatment many of these cases quiet down and get well.

When, however, these attacks continue to recur and become more severe at each recurrence, and when there is a distinct tumour perceptible in the region of the appendix, and when the patient is disabled from work and anxious for relief, Mr. Treves' suggestion may be carried out, and an operation undertaken "during a quiescent interval" for the removal of the enlarged and inflamed appendix. Mr. Pridgin Teale has recorded an interesting case of this kind,* which appeared to follow an injury at football. An incision was made directly over the tumour, and the enlarged vermiform appendix was found "imprisoned" between adherent omentum and adherent bowel, from which it had to be gradually separated and disentangled. It was removed within a quarter of an inch of the cæcum, and the patient made a quick and complete recovery.

In these relapsing non-suppurative cases it must be remembered that the recurrent attacks of localised adhesive peritonitis are apt to lead to constriction of the bowel, and thus to cause serious obstruction: a possible result which may be avoided by removal of the appendix.

In the *second* group of cases, where there is satisfactory evidence of suppuration having occurred, after a brief delay of five or six days, to observe the effect of suitable treatment by rest, appropriate feeding, and opiates, and if there is no marked improvement, but rather an aggravation of the symptoms, with a daily evening rise of temperature, the abscess round the appendix should be freely opened by an incision directly over it, and the pus evacuated, and the abscess cavity drained. A brief search may be made for the appendix, but this must not be pushed too far, owing to the risk of breaking down adhesions and opening a communication with the general peritoneal cavity. If found it should be ligatured and removed.

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* *British Medical Journal*, Jan. 17, 1891.

Punctures with exploring needles should be avoided in these cases, as serious disasters have followed such explorations.

We now pass on to the consideration of the treatment of cases of typhlitis and perityphlitis.

Cases of **cæcitis** or **colitis**—for in the cases we are now considering a portion of the ascending colon is usually involved in the inflammatory attack—are apt to occur in young or middle-aged persons who suffer from a tendency to constipation.

Such attacks are attended with constipation, intestinal discomfort, flatulence, distension, and pain especially referred to the right inguinal or lumbar region. Some localised tenderness will be found over the situation of the cæcum and adjacent portions of the ascending colon, not limited to any particular spot as is often the case in *appendicitis*,* but diffused over those portions of the first part of the large intestine we have mentioned. On palpation and percussion this part of the intestine will be felt to be distended and dull; indeed, to the experienced physician there is very little difficulty in distinguishing this comparatively mild form of *typhlitis* from the more serious *appendix* cases already referred to. There is often some rise of temperature, but rarely higher than 101° or 102° F., with restlessness, a furred tongue, foul breath, and a bad taste in the mouth. We believe these febrile symptoms are not necessarily caused by a local peritonitis, but are frequently dependent on superficial catarrhal ulceration of the mucous membrane and absorption of fæcal toxines.

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* McBurney has pointed out that the most important diagnostic sign in connection with inflammation of the appendix is the invariable presence of a minute point of exquisite tenderness, almost exactly two inches from the anterior iliac spine, on a line drawn from this process through the umbilicus.

Now the paramount **indication for treatment** in these cases is to evacuate the fæcal matters which are retained in this portion of the intestine, and which are distending it and irritating it, and giving rise to the symptoms detailed. If such a case be treated as many authorities direct an appendix case to be treated (and some seem to include even these mild forms of typhlitis in their general directions for treatment), and *opium* be freely given internally, the case will be made a protracted one, the tendency to obstruction will be intensified, the general sub-febrile condition will be aggravated instead of relieved, and the patient who might have been comparatively well in a few days will very likely be ill for weeks; for opium aggravates the paresis of the intestinal walls (and we have seen its administration pushed until an almost paralytic condition of the intestine has been induced), it diminishes all the intestinal secretions, and increases the febrile state due to absorption of retained excrementitious substances.

There is, however, no possible objection to the *local* application of opium, and it will generally be found that the pain can be effectually relieved by the application of hot linseed poultices sprinkled with laudanum; or the mixed opium and belladonna liniments may be applied on warm lint or flannel over the seat of pain and tenderness.

Professor Bouchard recommends the application of a thick layer of belladonna ointment covered by a large hot poultice.

The application of a few leeches over the seat of pain when it is severe has been recommended. We see no objection to this expedient, but we have never found it needful to resort to it.

To evacuate the contents of the intestine we should at first trust entirely to enemata; large enemata of warm soap and water, with which 2 or 3 ounces of olive oil have been mixed, should be slowly injected with a long tube, the patient's buttocks being raised so as to favour the retention of the enema. An enema of this kind should be administered every hour until complete relief has been obtained.*

If we find that there is no longer any great local pain or tenderness, gentle manipulation of the distended bowel may serve to assist in dislodging any remaining impacted fæces; and no harm can now arise from the use of a gentle saline aperient with a small dose of calomel. A powder composed of ¼ grain of calomel with 2 or 3 grains of sugar of milk, and followed by 4 or 6 ounces of Dinneford's fluid magnesia, to which a teaspoonful or two of lemon juice should be added, is as gentle an aperient as it is possible to give, and causes no excitement of the muscular wall of the intestine. When it is clear that a somewhat stronger aperient can be given without any risk, dram doses of sodium sulphate dissolved in 1½ ounce of peppermint water may be given every four hours until the bowels are completely relieved.

When all tenderness has disappeared, and there is no longer any rise of temperature, a mild aperient should still be given daily for some time until the bowel has recovered its tone. To promote the latter a tonic containing nux vomica, gentian, and ammonia will be useful. Intestinal antiseptics should be given by the mouth in these cases, if there is evidence of fæcal intoxication such as foul breath, a bad taste in the mouth, and a slight diurnal rise of temperature. *Salol* in 10-grain doses three times a day will answer this purpose well, or a grain of *thymol* made into a pill with soap powder and spirit may be given instead. Such intestinal antiseptics would also favour the healing of any intestinal ulceration that may possibly exist.

The patient should, of course, be kept at rest in bed during the first few days and until free from pain, and fluid food, such as milk mixed with seltzer or

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* Bouchard advises large injections twice a day, to render the large intestine aseptic, of water at 100° F., with 1½ dram of borax, and a dram or two of spirits of camphor and tincture of benzoin in each injection.

Apollinaris water, and occasionally a beaten-up egg should only be prescribed. A cup of tea or coffee with milk may also be allowed.

The occasional recurrence of pain and tenderness over the cæcum and ascending colon, which not infrequently follows an acute attack, we have found relieved by the application of iodine paint.

Chronic inflammation and superficial ulceration of other parts of the colon, the transverse portion, and especially the sigmoid flexure, with the appearance in the motions from time to time of stringy and sometimes blood-stained mucus, as well as apparent exfoliations of mucous membrane in the form of long tape-like fragments, seem to be not uncommon in cases of long-existing habitual constipation, especially in women. Such cases of **chronic colitis** we have treated very successfully by the long-continued use of intestinal antiseptics and regular aperients. When the sigmoid flexure is the seat of the ulceration, antiseptic injections are especially useful (a saturated solution of boric acid at a temperature of 90° F. may be used) as well as antiseptics given by the mouth.

For the latter purpose, perhaps, none is better than salol in 10-grain doses three times a day. Creasote or thymol may also be used in pills, or salicylic acid or salicylate of bismuth or naphthol may be given.*

DYSENTERY.

Dysentery is a *specific* ulcerative inflammation of the large intestine. A non-specific "catarrhal" form has been described, but this we have already spoken of as *chronic colitis.*

Much difference of opinion has existed with regard to the *etiology* of dysentery. Some regard climatic conditions such as great heat and moisture, as in tropical countries, or great and rapid alternations of temperature, or marsh malaria, as of themselves efficient causes of dysentery. Others refer the occurrence of the disease to exposure to cold and wet, to over-fatigue, and to eating unripe fruits. But the more generally accepted view is that its essential cause is a **specific germ,** and that the disease is propagated by contagion and infection.*

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* Pills containing substances intended to act in the intestine can now be obtained coated with *keratin*, which prevents their solution in the stomach.

It is said to occur *sporadically* in very hot seasons in temperate climates, but this is very rare; *endemically*, it is found to occur continually in certain hot countries, such as Hindostan, Cochin-China, Algiers, Egypt, etc., and although it may in some instances be found to co-exist with *malarial* affections, such as ague and hepatitis, yet it is found also to occur in countries quite free from malaria, and to be absent from others where malarial affections are common. It would appear, therefore, to have a different origin to that of ordinary malarial diseases.

Its extreme frequency and fatality as an epidemic amongst armies in the field show clearly that the massing together of great numbers of men under conditions of life which must necessarily, at times, be the reverse of hygienic, is most favourable to its origin and propagation. This fact is not inconsistent with the opinion that it is propagated by a specific germ, for in camps there often exist all the conditions most favourable to the diffusion of such a cause of disease, while every *predisposing* cause, such as over-fatigue, exposure to wet and cold, mental depression, unsuitable or insufficient food, and overcrowding are at times in operation.

The disease may originate in the use of impure water for drinking, just as typhoid fever does, and then be rapidly propagated by the further contamination of the water supply by dysenteric stools. In war, foul latrines, in which the air becomes charged with fœtid organic emanations, are stated to be a common cause of dysentery,* the effluvia from dysenteric stools being especially injurious.

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* The *amœba coli* or *dysenteriæ* has been found constantly present in the stools in tropical dysentery. These are supposed to be the agents in the production of secondary hepatic abscess.

It is suggested that the organic germs may, in such circumstances, enter the large intestine *per anum.* The reason of its constant *endemic* prevalence, in certain tropical countries, is to be accounted for by the fact that heat and moisture favour the propagation and diffusion of the specific germ, and also probably by the unhygienic habits of the natives.

The **symptoms** presented by sufferers from dysentery depend on the extent to which the diphtheritic inflammation, ulceration, sloughing, and thickening of the intestine have spread, and also upon its duration, whether *acute* or *chronic.*

We shall only here enumerate the more characteristic ones. At first there are abdominal pain and diarrhœa, the motions soon becoming *dysenteric,* that is to say, they contain a mixture of yellowish-white mucus and blood. The evacuations are preceded by painful tenesmus, especially referred to the region of the anus, and often involving the bladder, and there is a constant desire to evacuate the bowels, which usually only results in the passage (with much straining) of a small quantity of mucus and blood. There are pain and tenderness along the course of the large intestine, and the mucous membrane of the rectum is hot and inflamed, and intensely sensitive. As the ulcerative process advances the motions are found to consist chiefly of glairy mucus, pure blood, and shreds of mucous membrane which have been spoken of as "intestinal scrapings," with which hard fæcal masses are occasionally observed mixed. In severe epidemic cases the patients are harassed with a constant desire to go to stool and to urinate, which they do from fifty to 200 times in twenty-four hours. The pain is relieved after each stool. As the disease advances the motions become horribly fœtid, and the mucus gives place to a reddish sanious fluid, containing fragments of membrane, and mixed with a considerable quantity of pus. Together with these local symptoms there is much thirst and fever, with dry skin, rapid emaciation, loss of strength, and exhaustion from the constant intolerable pain, tenesmus, and loss of blood.

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* Parkes' "Hygiene."

Sporadic cases usually run a much milder course, and the symptoms are by no means so severe.

Several varieties of dysentery have been described; we shall only mention the chief of these.

1. A *benign sporadic* form, in which there is little or no fever, not more than ten or twelve evacuations in the day, and which usually results in cure in seven or eight days.

2. An *inflammatory* form with high temperature, hard rapid pulse, dry, raw, red tongue, and *not* very frequent stools.

3. A *bilious* form, in which the stools are *diarrhœic* as well as *dysenteric*, and contain yellowish or greenish bilious matters. There are nausea and vomiting, a coated tongue, and only slight fever.

4. A *rheumatic* form—with an affection of the joints resembling sometimes gonorrhœal rheumatism—more commonly fugitive pains appear in the joints, muscles, and intercostal spaces (pleurodynia).

5. An *intermittent* form characterised by remissions and exacerbations of severity.

6. An *adynamic* or *malignant* form marked by great prostration, and prominence of symptoms referrible to the nervous system, muscular tremors, restlessness, delirium, and fatal coma.

7. A *chronic* form such as is frequently met with in hot countries, a sequel usually of several acute attacks. The stools are sero-purulent, but usually free from blood; the anus is relaxed; a dull, heavy pain replaces the tenesmus; the belly is flat and retracted, and painful when pressed on. There is no fever, and the appetite is often good, but there is generally great emaciation.

Dujardin-Beaumetz * and some other authors notice particularly the absence of bile in the stools, and Professor Whittaker* points out that in severe cases all the digestive secretions are changed or entirely checked. The saliva becomes acid, and loses its glycogenic properties, the gastric juice becomes alkaline, and can no longer form peptones, while the secretion of bile is wholly arrested.

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* "Clinique Thérapeutique," 5th edit., vol. i. p. 758.

Attention to the following **indications** will assist us in the **treatment** *of cases of dysentery*:—

1. To relieve the pain and tenesmus in acute cases.
2. To avoid all irritation or aggravation of the diphtheritic inflammation of the diseased mucous membrane.
3. To remove foul accumulations from, and to arrest putrefactive processes in, the large intestine (*intestinal antisepsis*).
4. To promote (especially in chronic cases) a restoration of healthy action in the catarrhal and ulcerated mucous membrane.
5. To counteract any morbid septic agency in the blood, specific, malarial, or scorbutic.
6. To support the patient's strength.
7. To prevent the diffusion of the disease by suitable prophylactic measures.

1. Whatever differences of opinion may exist with regard to the free use of opium in acute dysentery—and there are some who object strongly to its administration—there can be none as to the necessity of its *limited* application, to allay the extreme distress of the patient, until other more slowly acting remedies can take effect. There should be no hesitation in attempting to at once relieve the pain and tenesmus in the rectum by the local use of opium. It is not intended to check the action of the bowels directly, or to lock up offending fæcal masses in the inflamed bowel, but it is simply given to relieve pain, and to moderate and modify the morbid painful muscular contractions of the large intestine. For this purpose

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* Pepper's "System of Practical Medicine," vol. ii. p. 804.

it is best to give opium in the form of a small enema, which may be repeated in half an hour if the first one or two should be quickly rejected. As the anal orifice is often excessively tender and sensitive, the enema must be given gently, and with care, a small flexible tube being used, which should be passed up several inches into the bowel. If there should be any difficulty on account of irritability of the anus, this may be readily overcome by brushing the anal mucous membrane freely with solution of cocaine. The enema tube should also be well oiled.

Each enema should consist of 20 minims of laudanum with 1 ounce of cold mucilage of starch.

2. To avoid all irritation of the inflamed mucous membrane the patient must be kept absolutely at rest, and, in all but the lightest cases, at rest in bed; he must pass his motions into a bed-pan, and not be allowed to resort to a water-closet. The abdominal surface may be gently rubbed with opium liniment and hot flannels kept applied there; hot bottles should also be applied to the feet, and the patient kept thoroughly warm with plenty of blankets.

All irritating ingesta, or food which leaves a residue prone to decomposition, must be avoided. Milk is the best food. It may be boiled, and then cooled with ice or diluted with iced water and made slightly alkaline by adding to each glass one or more alkaline tabloids. It is exceedingly undesirable that any undigested curd of milk should reach the large intestine; the milk should therefore be diluted and rendered distinctly alkaline. A little arrowroot may be mixed with the milk, and forms a useful and unirritating food.

Great objection has been taken by Prof. Bahadarji,* of Bombay, to the use of strong meat extracts in dysentery on account of their proneness to decomposition, but we can see no possible objection to light broths and clear soups flavoured with the expressed juice of fresh vegetables, as these leave no solid residue, and they are often grateful and refreshing to the feverish and exhausted patient.

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* Medical Society of London, Oct. 13, 1891.

Stimulants, unless in cases of much exhaustion, should be avoided, and when given should consist of small quantities of brandy and water or brandy and milk. A cup of tea may be permitted occasionally.

3. The next indication is to remove foul accumulations in contact with the inflamed and ulcerated mucous membrane, and to check the putrefactive processes in the large intestine. This is, in short, to carry out **intestinal antisepsis.** There are two ways of effecting this—(*a*) by gently-acting aperients, which will sweep away any fæcal accumulation from the intestine; and (*b*) by irrigation or washing out the intestine by cleansing or antiseptic fluids.

After we have allayed the severity of the pain and tenesmus by the local use of opium, as already described, we need have no difficulty or hesitation in carrying out the present indication.

As an aperient an initial dose of castor oil may be given, or 3 or 4 grains of calomel, or a seidlitz powder, or a dose of sulphate of soda. Dujardin-Beaumetz (who disapproves of opium) maintains that the fittest treatment is to give cholagogue purgatives in order to re-excite a secretion of bile which is absent; and the disease, he says, is cured when bile reappears in the stools. **Ipecacuanha,** he believes, acts as a cholagogue aperient. No doubt the absence of the antiseptic and alkaline bile favours putrefactive changes in the large intestine, and so tends to keep up the irritation of the ulcerated surface and the absorption of septic substances into the blood. Whether ipecacuanha acts in this way or not, or as a specific antidote to a specific poison, it is undoubtedly the most valuable remedy we possess for dysentery, especially in the acute form.

Its use is not, however, limited to acute cases; it has been found useful in the subacute attacks (which are apt to occur during the chronic forms), and even in the chronic form itself.

It has been given in various ways and doses. Some physicians give it in large doses, 20 to 40 grains every four to twelve hours, according to its tolerance by the patient. Its tolerance is promoted by the administration previously of a dose of opium or by the addition of some opium to each dose of ipecacuanha.

Maclean's plan is to first quiet the stomach by a dose of opium (10 minims of Battley's solution will suffice), and then to give half an hour afterwards 25 or 30 grains of powdered ipecacuanha in as little fluid as possible, so as to avoid its rejection by vomiting. After the dose a little ice may be sucked, or a tablespoonful of iced water swallowed. After eight or ten hours, a smaller dose—12 or 15 grains—should be given, and the remedy should be continued for some days, if necessary, in diminishing doses.

Cunningham, after the application of a mustard-plaster to the epigastrium and the administration of ½ a dram of laudanum, gives as much as 60 to 90 grains of powdered ipecacuanha. This causes much nausea and vomiting, together with reduction of pulse rate, profuse perspiration, cessation of pain, and tenesmus and quieting of the bowels for twelve to twenty-four hours, the next motion being soft, fluid, and free from blood or mucus. This dose may require to be repeated.

Dujardin-Beaumetz recommends another method: 30 to 60 grains of powdered ipecacuanha is introduced into a 6-ounce bottle, and 3 ounces of cold water poured on it; this is well shaken up, and a tablespoonful given for a dose. He mentions also the following pills with approval, which, he states, are largely used in the French navy:

℞ Pulv. ipecacuanhæ	6 grains.
Hydrargyri subchlor.	3 ,,
Extracti opii	1 ,,
Syrupi et mucil.	q.s.

Make into six pills. One of these is a dose.

Ipecacuanha has also been given in the form of *enemata*, and we may resort to this method when we encounter great intolerance of this drug by the stomach and in young children. One or two drams of the powder should be infused in 10 ounces of boiling water, and when cold a half or the whole of this may be injected with a long tube into the bowel. Ipecacuanha in *small* doses—viz. 1 grain in pills—is also advocated by Prof. Bahadarji, of Bombay.

But a more direct way of carrying into effect the indication we are considering, and a useful supplement to the preceding, is the **irrigation** of the large intestine by **antiseptic** fluids.

Dr. Fouquet, of Cairo,* has employed for this purpose a saturated solution of boric acid at a temperature of 90° F., and with excellent results both in acute and chronic cases. He uses a long *double* tube, communicating with a reservoir holding 3 or 4 quarts of the saturated solution. The patient is brought to the edge of the bed, so that the outflow from the bowel can be received in a suitable vessel. The fluid is allowed to flow in very slowly, and when there is much tenesmus the temperature is raised to about 100° F. It should be repeated at least every eight hours. "Every time," says Dr. Fouquet, "I have had recourse to this method, the amelioration in the state of the patients has been immediate, the tenesmus has usually been relieved by the first lavement, and has disappeared after three or four. The evacuations become less frequent, the thirst and the fever diminish, and the cure has always been rapid—in cases of average severity in four or five days."

A solution of borax, 5 grains to the ounce, or of borax and bicarbonate of soda, 5 grains of each to the ounce, with a few drops of spirits of camphor or tincture of eucalyptus, makes an excellent irrigation fluid for this purpose. The solvent action on mucus of the alkaline solution helps to detach and bring away foul inspissated mucous masses adherent to the diseased membrane, and to cleanse the surface of the ulcers and promote their healing. No treatment can be more rational or respond more directly to the anatomical and symptomatic indications of the disease than this method of antiseptic irrigation, which should be persevered in until there is good reason to believe the intestinal ulcerations are healed. Less hesitation will then be felt in supporting the patient's strength by suitable food when we know that all the decomposing residue is twice or thrice daily removed from contact with the diseased mucous membrane by irrigation.

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* "Traité Pratique d'Antisepsie," p. 387. Paris. 1888.

Various other substances have been used as enemata in dysentery—some of them more for their astringent than their antiseptic action. But in acute cases the simple and unirritating antiseptic enemata are the best.

Dujardin-Beaumetz recommends acetate of lead, 8 grains to the ounce of water; and Trousseau and others have obtained very good results, particularly in chronic cases, from nitrate of silver injections of the strength of ½ grain or a grain to the ounce.

Large irrigating injections of solution of nitrate of silver, 20 or 30 grains to the pint, have found much favour with American physicians. Osler insists on the necessity of *large* injections of from 3 to 6 pints, the warm fluid being allowed to flow into the bowel through a long tube. He has also used warm injections of quinine, 1 in 1,000 to 1 in 5,000, in amœbic dysentery with great benefit. The amœbæ are rapidly killed by it.

Iodine has also been employed with advantage in the proportion of 20 to 30 minims of the tincture to an ounce of water.

Prof. Whittaker* has reported a case "almost *in articulo mortis*, where complete cure followed the irrigation of the bowel, on three occasions with 3 pints of water containing 3 drams of alum."

Salicylic acid, charcoal, chlorine water, creasote emulsions, perchloride of mercury, and decoctions of bark and chamomile have all been advocated for the same purpose, and some use simple iced water.

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* Pepper's "System of Medicine," vol. ii. p. 809.

Enemata of *creolin*, $\frac{1}{2}$ per cent. or 1 per cent. solution, have been given with much success by some Continental physicians. Large enemata, from 4 to 6 pints, have been given, twice or three or four times a day. They are absolutely non-irritant to the bowel.

That this treatment by irrigation should be successful it must be carried out by the physician himself or a thoroughly trustworthy assistant. From 3 to 4 pints are as much as can be safely introduced in the adult. The patient should lie on his back or on his left side, with his head low and the hips raised, and the injection be introduced slowly by a funnel, or fountain and tube, or a ball syringe the nozzle of which has been carefully lubricated. If pain is complained of we must desist injecting for a few minutes, and then inject more, until the maximum possible is reached.

4. The next indication has been to a great extent anticipated in the preceding, for *intestinal antisepsis* properly carried out is better calculated than any other means *to promote* a restoration of healthy action in the catarrhal and ulcerated mucous membrane. But in chronic and sometimes in acute cases the catarrhal state set up by the disease in the intestinal mucous membrane needs the intervention of **astringent** remedies.

Bismuth, the subnitrate, carbonate or oxychloride, is one of the best remedies for this purpose.

Twenty grains of the subnitrate with 5 grains of Dover's powder, 5 grains of light magnesia, a dram of mucilage of tragacanth, and an ounce of infusion of simaruba may be given twice or thrice a day. Much larger doses of bismuth than this have been given, 30 to 60 grains every two hours; these large doses act, perhaps, as much by their antiseptic as their astringent property. Stronger astringents are sometimes required—a dram of tincture of catechu may be added to each dose of the preceding, or 10 grains of extract of logwood.

In old and obstinate cases acetate of lead (4 grains of the pil. plumbi cum opio three times a day or a suppositoria plumbi cum opio twice a day), or sulphate of copper (¼ grain in a pill with 3 grains of Dover's powder, three times a day, or a rectal injection of 10 grains of sulphate of copper, 20 minims of tincture of opium, and 4 ounces of water), or nitrate of silver (¼ grain made into a pill with 2 grains of kaolin ointment, and with or without ½ a grain of powdered opium, three times a day), have all been found useful.

5. The fifth indication is to correct any morbid septic agency in the blood, specific, malarial, or scorbutic. It seems probable that ipecacuanha may act as a microbicide, and arrest the development of the specific germ of this disease.

In cases in which the dysentery is clearly associated with malarial intoxication quinine must be given in full doses.

Maclean recommends that 20 grains of quinine in solution (we would suggest in lemon juice) should be given before the ipecacuanha treatment is begun, and that then these two drugs should be given alternately until the characteristic effects of both are produced.

In chronic malarial cases it may be desirable to prescribe arsenic; $\frac{1}{50}$th of a grain of arsenious acid, or $\frac{1}{12}$th of a grain of arseniate of soda, gradually increased, may be given in a pill three times a day after food.

In scorbutic cases the fresh Bael fruit has been strongly commended by Anglo-Indian physicians. Lemon and lime juice may also be given, and fresh ripe fruit and vegetables.

6. We must support the patient's strength by nutritious **food.** During the onset of the acute attack little food should be given, as little can be assimilated, and the residue would simply act as decomposing foreign substances irritating to the diseased intestine. Milk is, as we have said, the best food in these cases,

diluted with water or mixed with a little thin arrowroot. If we notice that curd of milk passes in the stools, we must replace the milk by weak animal broths and thin soups.

In carrying out the ipecacuanha treatment, if much nausea and vomiting are excited, it is important, in order that the patient's strength be not exhausted, that sufficiently long intervals between the doses should be allowed for the administration and assimilation of nourishment.

If there is great prostration, alcoholic stimulants must be given—a pure spirit, either brandy or whisky, or sound port or Burgundy, mixed with water, may be prescribed in the quantity necessary. Transfusion has been employed with success in cases in which life appeared to be endangered by hæmorrhage and anæmia.

After the severity of the acute stage is over, and when appetite and digestive power have returned, a more liberal diet should be allowed. Eggs, whipped up with boiling water, and a little nutmeg and brandy and cold milk added, are an agreeable and highly nutritious form of food. Pounded sweetbread, or chicken or finely-divided raw meat or powdered meat and crumb of stale bread may be added to broth, clear soup, or thin cocoa. When convalescent, tender meat, fowl, fish, eggs, milk, ripe fruits, and fresh vegetables may be given at suitable intervals, and in proportion to the digestive capacity.

We should seize the earliest opportunity of further supporting the patient's strength by suitable tonic medicines. Bark, quinine, nux vomica, simaruba, nitro-hydrochloric acid, the several preparations of iron, may all in their turn, alone or combined, be given with advantage.

Dujardin-Beaumetz maintains that there is only one treatment for **chronic** dysentery, and that is an exclusive milk diet; and best taken, together with baths, at Vichy.

Change of climate is often necessary to restore completely the strength of the dysenteric patient. A sea-voyage, removal to a bracing sea-coast, or a moderately high mountain resort, or a dry, bracing upland, may be chosen, according to circumstances.

7. We finally come to the important indication of adopting proper **prophylactic measures.**

One of the most important of these is the proper treatment of the dysenteric stools. They should either be mixed with sawdust and burnt, or buried in the soil a few feet below the surface, boiling water having been previously thrown on them. They must not be emptied into water-closets or privies. If it is not possible to avoid this, they should be first treated freely with carbolic acid and boiling water. The sick room should be well ventilated with open windows, the bedding frequently changed, and all articles soiled by the discharges plunged into boiling or very hot water.

Individuals exposed to contagion and during epidemics should avoid all predisposing causes. All drinking water, unless absolutely free from possible suspicion, should be boiled, and milk also. All articles of food should be avoided that have any tendency to excite intestinal catarrh and that are indigestible, as unripe fruit, coarse vegetables, etc. Avoidance of foul latrines and water-closets should be insisted upon. Warm clothing, and especially a flannel band round the abdomen, should be worn, as chill predisposes to most infectious microbic diseases. Removal from the infected area, when possible, is, of course, advisable.

In the management of armies and other large bodies of men it is especially important to look to the supply of drinking water, to avoid overcrowding, to provide proper food, properly cooked, and to secure habits of personal cleanliness, and the proper disposal of refuse.

ADDITIONAL FORMULÆ.

For dysentery in infants.

℞ Pulv. ipecac. comp., 3 grs.
Quininæ tannatis, 5 grains.
Sacchari albi, 30 grains.

M. et divide in pulv. 6. A powder three times a day. (*Bamberger.*)

Sulphate of magnesia in acute dysentery.

A teaspoonful of a saturated solution of magnesium sulphate with 10 minims of dilute sulphuric acid is to be given every hour or two until the characteristic symptoms disappear. (*Leahy.*)

In strong subjects 1 oz. doses every morning. (*Poynder.*)

Astringent pills in dysentery.

℞ Argenti nitratis, 1 grain.
Ipecacuanhæ pulv., 3 grains.
Morphinæ hydrochlor., ½ gr.

In pil. To be taken every six or eight hours. (*Whitla.*)

Or

℞ Argenti nitratis, ⅙ grain.
Pulv. opii, ⅛ grain.

In pil. To be taken an hour after meals. (*Packard.*)

Enemata in dysentery.

Various *antiseptic* and astringent substances have been successfully applied in enemata. Free irrigation with warm water has been found as useful as any. (*Korytin.*)

One per cent. solution of carbolic acid.

Bichloride of mercury, daily injection of 7 oz. of a 1 in 5,000 solution.

℞ Quininæ sulph., 10 grains.
Tinct. camph. comp., 4 drs.
Decoct. amyli ad 1 oz.

This warmed is to be injected slowly *after* the bowel has been washed out with 1½ pint of warm water. (*Poynder.*)

Creolin, 1 dram to a pint of water. (*Watson.*)

Alum, ½ oz. to ½ pint of water twice daily. (*Hepburn.*)

Bisulphide of carbon, 1½ gr. in 1½ oz. of water twice daily. (*Jakotleff.*)

Sulphate of copper, 10 grains with 1 dram of laudanum and 4 oz. of water. (*Easby.*)

℞ Argenti nitratis, 2 to 8 grs.
(For children 1½ grain.)
Aquæ destill., 5 oz.

To make four enemata, two to be given daily. (*Bamberger.*)

℞ Naphthalin, 75 grains.
Olive oil, 5 drams.

To be injected high up three or four times a day. (*Minerbi.*)

Suppositories for dysentery.

℞ Tannin, 15 grains.
Opium, 3 grains.
Cacao butter, 2½ drams.

To make four suppositories. (*Bamberger.*)

Another.

℞ Naphthalin, 2½ drams.
Cacao butter, 2½ drams.

To make five suppositories. (*Minerbi.*)

CHAPTER XII.

DISEASES OF THE INTESTINE—THE TREATMENT OF INTESTINAL OBSTRUCTION.

Intestinal Obstruction, Acute and Chronic: Its Nature and Seat often difficult to ascertain—Its Causes: (1) Accumulations *within* the Canal—(2) Compression or Constriction from without—(3) *Stricture*, *Malignant*, *Cicatricial*, or *Peritonitic*—(4) Strangulation or Incarceration, External and Internal—(5) Positional Lesions (*Intussusception*, Twisting, Kinking, etc.)—*Diagnostic* Measures—Rectal Exploration—External Manipulation—Percussion—General Symptoms—*Acute Intussusception*—Its Symptoms—*Gall-Stones*—Previous Attacks of Peritonitis. *Treatment* of Simple Compression or Traction—Fæcal Impaction—*Stricture*—Caution in use of Opium—Needful in *Acute* Cases—*External* Applications—Ice—Warmth—Opium—*Taxis*—Large Enemata of Warm Water—*Intussusception* Cases—Injection of Air—Prolonged Warm Baths—*Puncture* to relieve Distension—Nutrient and Supporting Enemata—*Operative* Measures.

Obstruction or closure of the intestinal canal may arise from a variety of causes, but certain symptoms are necessarily common to all. The chief clinical and symptomatic distinctions will depend upon whether the closure of the intestine has been brought about suddenly and unexpectedly, or slowly and gradually, whether, in short, it is what is termed *acute* or *chronic*.

Certain differences also in the clinical manifestations will arise according to the situation of the obstruction, *i.e.* according as it is situated in the upper or lower part of the intestinal canal, and further, according to the completeness or incompleteness of the obstruction.

Although from the similarity, and, in many instances, the identity of the phenomena attending those cases the treatment appropriate to them is the same, even when their causal relations remain obscure, yet in all instances, in order to institute an appropriate treatment, it is desirable, and in many cases it is essential, to arrive at an accurate estimation of the nature and seat of the obstruction. It will, therefore, be necessary to review briefly the chief causes of intestinal obstruction, and to mention whatever distinctive symptoms have been observed to characterise the different varieties.

1. The intestinal canal may be blocked by substances that have **accumulated within it**, such as indigestible substances taken with the food, or foreign bodies of any kind, insoluble matters taken in the form of medicines (large and repeated doses of peroxide of iron or magnesia), masses of intestinal worms, or of indurated fæces, and by large biliary and intestinal concretions. (Gall-stones large enough to obstruct completely the small intestine sometimes ulcerate their way from the gall bladder into the intestine through the walls of both; calculous deposits also occasionally form within the intestinal canal itself, composed generally in great part of concretions of phosphate and carbonate of lime.)

2. The intestine may be obstructed by **compression** or **constriction** arising *external* to it. Tumours, glandular, vascular, or visceral, benign or malignant, or displaced viscera, may compress adjacent intestine, and cause its partial or complete occlusion. In this way the rectum may be compressed by a displaced uterus, or by a uterine or other pelvic tumour.

Sometimes one portion of diseased or displaced intestine may compress another, either by its own weight, or by dragging on its mesenteric attachment.

3. **Stricture** is a common cause of obstruction, especially of the rectum and large intestine. This may be, and frequently is, malignant, and dependent on a cancerous growth in the intestinal walls, or it may be simply cicatricial, the result of the healing of dysenteric, syphilitic, or other forms of intestinal ulceration. Simple hypertrophic stricture is rare. Obstructing polypoid growths occasionally occur.

Stricture may also depend on chronic peritonitis matting together portions of the intestine and constricting them.

4. Obstruction may be due to **strangulation** or **incarceration** of the intestine, as in herniæ. External hernial protrusions are obvious, and readily recognised, but the strangulation may be *internal.* A portion of intestine may get incarcerated by fibrous bands stretching across it—the result of former peritonitis; or it may get into an accidental or congenital fissure in the omentum or mesentery, or into some natural aperture as the foramen of Winslow, or one of the openings in the diaphragm. Or strangulation may be caused by the vermiform appendix or a diverticulum from the intestine becoming adherent by its free end, and so forming a kind of ring in which the intestine may be caught.

5. **Positional lesions** of the intestinal walls. Under this heading we must group cases of *intussusception* or *invagination*, as well as those dependent on *twisting*, *rotation*, or a *sudden bend* of the intestine.

It is apparent from a survey of those various causes of intestinal obstruction that a great number of these cases are not amenable to *medicinal* treatment, and that they can only be remedied by surgical interference. If it were possible in every case to, at once, determine with accuracy the cause of the obstruction, we should be able to summon surgical assistance, and by *early* operation many lives would probably be saved. But this is not possible, and in many instances it is only after the failure of such measures as we shall presently describe, to overcome the obstruction, that we are enabled to conclude that the lesion is of such a nature as can only be remedied by surgical operation.

A thorough and systematic examination of every case will, however, usually enable us to arrive at an approximately accurate diagnosis.

We will assume that the possibility of the case being one of acute peritonitis has been considered and eliminated, and that the possible existence of a strangulated external hernia has not been overlooked.

In an old person, or one of middle age, the frequency of obstruction from fæcal accumulation, or from stricture of the rectum, will point to the propriety of an immediate digital examination of the rectum which would at once detect the existence of a fæcal accumulation or the presence of stricture. The history and previous symptoms of the case would corroborate this conclusion. Obstruction from **fæcal accumulations** is usually preceded by habitual constipation, and the occasional passage of very large motions. Fæcal tumours may often be felt in the course of the colon, and we may find that a like attack has occurred before, and been relieved by free evacuation of fæces. In stricture of the rectum, malignant or otherwise, the previous history would afford abundant evidence in corroboration of the inference from local exploration. Pelvic tumour compressing the rectum would also be detected by careful examination made by the rectum and vagina, together with external manipulation.

If the patient should be a child, and the case be one of intussusception, a rectal examination would also be of value, for if the invaginated mass had made its way into the rectum, as it sometimes does, we should be able to detect its presence there.

Much assistance in diagnosis may be derived from the consideration of the mode of onset of the obstruction, whether acute and sudden, or chronic and gradual; we should also endeavour to determine whether it is situated in the small or large intestine.

Severe and early vomiting, intense pain, scanty urine, and, generally speaking, the acuteness and rapid progress of the case point to the small intestine as the seat of the lesion; while less severe pain, less tendency to vomiting, an average flow of urine, also a gradual onset and slower progress of the case, point to the probability of the obstruction being in the large intestine. Evidence on percussion over the lumbar and epigastric regions of great distension of the colon would naturally point to the obstruction being in the large intestine, while, on the other hand, evidence of a non-distended and contracted condition of the colon would indicate that the obstruction was in the small intestine, a conclusion which would be strengthened by the presence of much distension and flatulent commotion in the umbilical and hypogastric regions.

If we are satisfied that the obstruction is situated in the small intestine, and if the patient is a young child, we should first think of *intussusception.* This is usually acute, the rare cases of chronic intussusception being commonly observed in young adults. The characteristic symptoms of **intussusception** are sudden and severe, but intermitting colicky pains, diarrhœa and tenesmus, with mucus and blood in the stools, the detection of a sausage-shaped tumour in the abdomen, increasing in size and changing its position, and the possibility, occasionally, of feeling the terminal part of the invaginated gut in the rectum.

The diagnosis would be confirmed if we found gangrenous shreds, or a complete cylindrical portion of intestine passed per anum.

Obstruction by **gall-stone** is usually situated in the small intestine between the duodenum and the iliocæcal valve, in the neighbourhood of which it may be arrested. It usually occurs in middle-aged women, and, in favourable circumstances, a correct diagnosis seems possible. It would be founded on the occurrence of the symptoms of obstruction immediately after a severe attack of biliary colic with jaundice, and, probably, with a history of former attacks of obstructive jaundice.

The history of previous attacks of **peritonitis** will lend probability to the existence of adhesions between coils of intestine, or the presence of constriction from bands of adhesion. But these and many other conditions, such as twisting, strangulation, etc., it is impossible to diagnose with any approach to certainty. The possibility of filling the colon with fluid enemata is another means of distinguishing whether the obstruction is in the small or large intestine.

Careful physical examination of the abdominal cavity should enable us to detect the existence of any tumour capable of causing obstruction of the intestine by compression.

In considering the **treatment** of cases of intestinal obstruction we shall deal with the simpler ones first.

When the obstruction is ascertained to be caused by the *compression* or *traction* of an abdominal or pelvic tumour, or an enlarged or displaced viscus, our efforts must be directed to the mechanical removal of this pressure or traction. We may be enabled by manipulation and posture to shift the position of a tumour of the abdomen or pelvis and retain it where its pressure will be removed, if not permanently, yet from time to time, so as to admit of the introduction of an enema or the action of a laxative. The pressure of a cyst may be relieved by puncturing it, that of a displaced womb by its replacement. In such cases it will also be necessary to soften any accumulation of fæces above the point of compression by gentle laxatives and by large enemata, the quantity of fluid injected being regulated by the situation of the obstruction. Warm soap and water, with 2 or 3 tablespoonfuls of olive oil added to it, is the best enema to use. If there has been a prolonged retention of fæces so that they have become very hard, and if there is no great urgency in the case, it is often a good plan to inject with a long tube, passed up as far as it will easily go, 4 ounces of olive oil, and to let it remain for twelve or twenty-four hours, when a large enema of warm soap and water may be given and repeated until all the hard accumulated fæces have been evacuated. A tablespoonful or two of castor oil mixed with a little warm milk may at the same time be given, or 2 or 3 grains of calomel followed by a draught containing 3 or 4 drams of sulphate of soda and $\frac{1}{2}$ an ounce of tincture of senna in 2 ounces of peppermint water. After the bowels have thus been thoroughly relieved it may be desirable to give a daily aperient so as to keep the motions semi-fluid or soft, and prevent future accumulations. A teaspoonful of a confection consisting of equal parts of the confections of sulphur and senna of the B.P. may answer this purpose; or a daily dose of two or three teaspoonfuls of Carlsbad salts dissolved in half a pint of hot water. The diet, also, should be so arranged as to favour fluidity of the motions.

When the obstruction is due to **impaction of fæces** in the large intestine, the indications for treatment are obvious, and easily fulfilled. Hard fæculent accumulations in the rectum that can be reached by digital exploration may require to be broken down and removed by the finger, aided by a metal scoop or any suitable blunt instrument. The rest of the treatment for these cases and for accumulations higher up in the large intestine must be conducted much in the same manner as that just described for accumulations from compression. Many, and rapidly-repeated, large enemata, introduced high up by means of a funnel and siphon tube, will be required to get rid of accumulations in the first and second portions of the colon, and the enemata must be retained as long as possible in order to exert the necessary softening effect; they should, therefore, be given in the knee and elbow position, with head and shoulders depressed, or the pelvis may be raised on hard pillows or cushions. In this and in all forms of intestinal obstruction the enemata should be given by the medical attendant himself, who will know how best to promote the ascent and retention of the fluid. Gentle laxatives should be given at the same time by the mouth, as above described.

In **obstruction** from *stricture*, which is usually situated in the rectum or sigmoid flexure of the colon, if the stricture is impassable, which is rarely the case at first, an operation must be resorted to for the relief of the obstruction by making an artificial anus; but if the *stricture* is not complete, and if it can be reached by the finger or a rectal bougie, it may be dilated and the accumulations above it softened by enemata of warm water or warm soap and water with olive oil, or an enema of olive oil alone, at first, as already mentioned, which may be injected by means of a small tube passed through the stricture. At the same time, laxative medicines should be given to soften and make fluid the evacuations, and these should be continued so long as the *stricture* remains.

Simultaneously in all these cases, if much abdominal pain exists, as may be the case from flatulent distension of the intestine, **opium** must be given to relieve the pain, but only *in small quantity*, and just sufficient to relieve the pain and no more. Five to 10 minims of liquor opii sedativus may be given with a dose of castor oil and repeated with a second dose if the pain is not relieved. Or a hypodermic injection of $\frac{1}{6}$th of a grain of hydrochlorate of morphine and $\frac{1}{120}$th of a grain of sulphate of atropine may be given, and repeated after three or four hours, if needed.

But in these forms of intestinal obstruction it is exceedingly important to be sparing and careful in the use of opium, and to remember that it is better, when possible, to relieve them without the use of opium at all; for opium tends to paralyse the muscular walls of the intestine, and if given in large and repeated doses, especially in old people, it will do this so effectually that it will be exceedingly difficult to rouse the overdistended and sub-paralytic intestine to activity, and a fæcal obstruction, especially when situated high up, may be rendered immovable, or, at any rate, very difficult and tedious to remove.

Necessary as the judicious use of opium is in the treatment of most cases of intestinal obstruction, we have seen much harm result from its indiscriminate use, and we consider the common dogma that "in intestinal obstruction opium is our sheet anchor," mischievous and dangerous, for it leads the young and inexperienced practitioner to give opium largely and indiscriminately in all these cases.

The same objection does not apply to **belladonna,** and Mr. Bryant has warmly advocated its use in these cases, applied externally, the extract mixed with glycerine, and given internally, with or without opium.

In all cases, however, of **acute** obstruction, or obstruction attended by *acute* symptoms, suggestive of enteritis or peritonitis, or intestinal spasm, opium should be given, although it must honestly be admitted, seeing that nine out of every ten such cases end fatally, the opium, in the great majority of cases, simply contributes to euthanasia! Dr. Hunter McGuire, referring to the use of opium in these cases, observes: "*To carry it farther than slight narcosis and arrest of the most painful symptoms of obstruction is an abuse of the remedy.* By such abuse the symptoms will be masked, and both patient and practitioner deceived."*

Obstruction from a large gall-stone, impacted in the small intestine, has been successfully treated by rest, small doses of opium, and abdominal massage.

To allay thirst and sickness, fragments of ice may be sucked, or mouthfuls of strong coffee iced, or iced soda water may be swallowed. The application of pounded ice to the abdomen in acute strangulation of the small intestine is said to have been attended with good results, it lessens the risk of peritonitis, and has, occasionally, overcome the obstruction; but warm applications are generally more soothing and grateful to the patient, such as hot flannels or a hot linseed-meal poultice well sprinkled with laudanum.

Abdominal taxis has been highly commended as affording a chance of overcoming the obstruction, if applied early, before the strangulation has been fixed by inflammatory adhesion; it has been attempted in the warm bath, or with the patient under chloroform, or while being given large enemata of warm water. It obviously affords a chance, but quite a *blind* chance, and unless applied very gently it may do harm by compromising the success of subsequent operative measures.

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* Pepper's "System of Practical Medicine," vol. ii. p. 863.

The occasional value and usefulness of large injections of warm water, even in acute obstruction situated in the small intestine, is admitted, and no surgical operation should be attempted until this resource has been tried. The water may be introduced by means of the syphon tube and glass funnel, the patient being placed in the knee and elbow position, with the head depressed and the buttocks raised. The injection should be made slowly and gradually, so as to allow time for it to pass through the coils of intestine.

Cases of **intussusception** require special consideration. When a definite diagnosis can be made, and in the case of ileo-cæcal and colon invagination it is often possible to reach the lower end of the invaginated bowel by digital examination in the rectum; or the presence of the peculiar tumour, and the discharge of blood and mucus from the bowel will distinguish this from other forms of obstruction; in such cases, after quieting the patient, and relieving pain by the use of opium (in *small* doses in children), attempts must be made to reduce the invagination mechanically. In order that these may be successful, they must be made early, before time has been allowed for the invaginated portion to become adherent or gangrenous. We should first push back the mass in the rectum by the fingers, or a sponge sound, the sponge being well oiled, and applied with firm but gentle pressure. By this means we may partially reduce the invagination, and we should then endeavour to complete it by the injection of a considerable quantity of warm water or of air. It is usual to first place the patient under the influence of an anæsthetic, and in a position which will mechanically favour the replacement of the intestine. The air may be injected by means of a bellows with a well-fitting rubber tube, or by means of a pump with a stop-cock. Air is better than water in these cases, and success has not infrequently followed its use. Serious and fatal accidents have, however, also attended this forcible inflation of the intestine with air. It is only applicable to *quite recent* obstruction.

Prolonged warm baths have been found to relieve the pain, and may certainly favour the reduction of internal strangulation.

For the relief of the extreme distension of the intestines by pent-up gases, which causes so much distress in many of these cases, puncture with a fine exploring trocar has been advocated. The trocar should be carefully disinfected by passing it through the flame of a spirit lamp, and then dipping it in carbolic solution, and it should be plunged into such parts of the intestine as appear from percussion to be specially distended and superficial. By removing the accumulated gas we relieve the intra-intestinal pressure, as well as the dyspnœa caused by the meteorism. It must be remembered that the trocar may sometimes pass between the coils of intestine, but this is of no consequence, and when there is great distension it cannot be difficult, with care, to avoid this.

An important point in the management of these cases is to support the strength of the patient, and ward off fatal collapse by the administration of suitable nourishment. When the obstruction is high up, and there is much vomiting, it will be necessary to have recourse to frequent small enemata of unirritating substances. A few ounces of warm peptonised milk or beef-tea, with a small quantity of brandy, will answer the purpose best. A little iced milk or iced coffee and milk may be given by the mouth if agreeable to the patient, and if it does not excite vomiting. When there is stercoraceous vomiting great relief is often afforded by washing out the stomach with some antiseptic fluid, such as a saturated solution of boric acid.

But in most cases of *acute* obstruction, especially when it seems to be in the small intestine, or possibly connected with disease of the vermiform appendix, keeping in mind the great mortality that attends these cases under ordinary medical treatment, we should not hesitate to recommend early recourse to surgical exploration. We would again repeat our caution as to the use of opium. This drug when given in large doses is apt to cast a delusive calm over the aspect of the case, and to lead to a false sense of security; the fact that nine out of every ten such cases end fatally gives little support to the extreme laudation which the use of this drug has received. When given in large quantities in cases of fæcal impaction, it induces a sub-paralytic condition of the intestine, and protracts recovery greatly, and, we believe, tends often to an erroneous diagnosis as to the nature of the obstruction.

It is a good rule in all cases of intestinal obstruction of a doubtful nature, especially when the onset and the symptoms are acute, to seek surgical advice and co-operation early in the case, and to regard opium simply as a temporary calmative. Moreover, in those few cases of acute obstruction which recover without surgical interference, it must always be doubtful whether there has been any actual mechanical constriction of the bowel, and whether they are not simply instances of fæcal impaction. Mr. Treves observes, and no doubt with reason, "in not a few instances the previous treatment has compromised the success of any interference by operation. The engorgement of the bowel has been increased by aperients, and the *normal reflexes* have been *impaired* or *annihilated* by *excessive doses* of *opium* and *belladonna*." *

In the **most urgent cases** of acute obstruction, as Mr. Treves points out, the chief object of surgical interference is to relieve the "dangerously engorged bowel above the occluded part," and the removal of the *cause of obstruction may*, and indeed in many cases *must* be postponed.

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* "Operative Surgery," vol. ii. p. 380.

The engorged bowel is "filled up to the very stomach with a foul and fæculent fluid, by which the patient is being poisoned. The gut is paralysed, the normal reflexes are lost, there is no peristaltic wave to free the many bends and twists which must be undone to secure a free passage, and the patient dies with some pints of the foulest and most putrid matter still lodged in a viscus possessed with an instinct to absorb its contents." It is the complete evacuation of this that is the urgent matter.

"**Enterotomy,**" Mr. Treves goes on to say, "may appear to be a somewhat unsurgical procedure, and not a very brilliant or complete operation, but still it can claim results which appear to indicate the direction in which surgical measures should tend."

No anæsthetic should be given in these cases. The abdomen should be opened in the median line below the umbilicus, and an enterotomy performed. "The incision should be as small as possible, just large enough to allow one distended coil to be drawn forward with the finger. There should be no searching for the cause of the obstruction. Every minute is of consequence. The bowel is rapidly fixed to the parietal wound by a few sutures, which do not penetrate beyond the submucous coat, and the gut may be best evacuated by a large trocar and cannula, to the end of which a long indiarubber tube is fixed. The contents of the gut are thus carried away from the wound. A way for the trocar through the outer coats of the intestine must be made with a scalpel. As the bowel is emptying itself, it may be more accurately secured to the margins of the parietal wound by a few more sutures." The stomach should be washed out, either before or after the operation, with hot water containing some boric acid in solution, by means of a Leiter's irrigator. The pulse is improved, and the patient revived by the hot water. In less urgent cases a rapid search may be made for the obstruction, but if this is not quickly found no time must be lost, and the bowel should be immediately opened.

In other cases still less urgent, after washing out the stomach with hot water, an anæsthetic may be cautiously administered; it must not, however be pushed to complete insensibility. An incision should then be made in the median line between the umbilicus and the pubes *large enough to admit the hand*, and search made for the site of the obstruction. "As soon as the abdomen has been opened three fingers may be introduced, and the cæcum examined." If empty, the obstruction is in the small intestine, if distended, then probably in the colon, and the direction of the further search is determined accordingly.

"After the cause of the obstruction has been found and relieved, it will in very many instances still be wise to evacuate the distended bowel. The opening made may be closed as soon as the gut is considered to have sufficiently emptied itself; but it may with greater safety be left open for the time being, and be closed by subsequent operation." *

In *laparotomy* for *intussusception* the mortality is large. Of the seventy-three cases collected by Mr. Barker sixty died. The recoveries were, all but one, in the thirty-four cases in which the bowel was reduced. The other recovery was one out of fourteen in which the intussusception was resected. Mr. Watson Cheyne, however, has had only one death in five cases, and he believes that the result depends on the length of time that has been allowed to elapse before operating.

An impacted *gall-stone* or enterolith may possibly be broken up or crushed without opening the intestine, but for this purpose it must be moved from the seat of impaction, where the intestine may be inflamed, ulcerated, or gangrenous. It should be moved upwards into the distended and healthier bowel, and dealt with there, either by crushing, or, if this is not practicable, by removal by an incision in the free border of the bowel, and in its long axis. If the gut should be gangrenous at the obstructed part it must be resected, and an artificial anus established.

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* Further precise details will be found in Mr. Treves's work already mentioned.

In cases of chronic obstruction, and when the disease is in the colon or rectum, colotomy, *lumbar* or *iliac*, is usually performed, and an artificial anus established.

For fuller details as to surgical measures we must refer the reader to modern works on operative surgery.

CHAPTER XIII.

DISEASES OF THE INTESTINE—THE TREATMENT OF INTESTINAL PARASITES.

Parasitic Worms *peculiar* to Man — *Tapeworms* — Symptoms — Diagnosis. *Treatment* — Preparatory—Vermicidal—Filix Mas —Kousso—Pomegranate—Pelletierine—Turpentine —Kamala —Pumpkin Seeds—Thymol, etc.—*Lumbrici*, or *Round Worms* — *Treatment* — Santonin — Kamala—*Oxyuris vermicularis*, or *Threadworm* — Causes — Symptoms — *Treatment* — Difficulties — Enemata — Suppositories — Purgatives—Tonics. *Trichocephalus dispar* — *Anchylostomum duodenale*. Additional Formulæ.

The successful treatment of intestinal parasites depends on its adaptation to the different species, and requires a knowledge of the habits and mode of development of each kind. Prophylaxis also must be founded on a thorough knowledge of their natural history. Cleanliness and care in personal habits, and in the selection and preparation of food and drink, will, however, certainly protect us from many species. All animal food should be sufficiently cooked, all suspected water carefully filtered, and more care should be observed in our association with domestic animals.

The seven kinds of parasitic worms *peculiar* to man chiefly concern us here. Three of these belong to the *tapeworm* class, viz. :—

Tænia solium, tænia mediocanellata, or saginata, and bothriocephalus latus.

Four to the class of *round worms*, viz. :—

Ascaris lumbricoides, oxyuris vermicularis, trichocephalus dispar, and anchylostomum duodenale.

Tapeworms.—The mature tapeworm as it is found in the intestinal canal of man and other animals is a soft, flat, white tape-like-looking worm, having a small head, furnished with suckers, and a circlet of hooks, by which it clings to the mucous membrane.

A slender neck succeeds the head, and gradually widens into the body, which is composed of segments (called proglottides) which become larger and larger the farther they are from the neck, until they acquire their full size, when they become detached, singly, or several linked together. The worm has neither mouth nor intestinal canal, but derives its food by imbibition from the intestinal juices in which it lies. The mature segments consist almost wholly of sexual organs of both kinds, and are, therefore, self-impregnating. In the eggs contained in these segments a six-hooked embryo is developed. These eggs when discharged from the intestinal canal, either free or enclosed in the proglottis, for the most part perish, but if they become swallowed by animals, as they sometimes do, then the six-hooked embryo is set free, and by some means or other migrates from the digestive canal into the liver, muscles, or other organs of the animal. In favourable circumstances it there assumes its scolex or larval form. This usually consists of a cyst, with an inverted head and neck resembling that of the parent tapeworm. Now, if the flesh of animals containing these scolices, in an active state, be eaten by another animal, the scolices may be set free by stomach digestion, and passing into the small intestine, the head of the scolex becomes everted, and fastens on to the intestinal mucous membrane, the cyst disappears, and by successive budding another tapeworm colony becomes developed. This brief account of the life history of a tapeworm is sufficient for our present purpose. For a tapeworm to be developed it is only necessary that a living embryo be introduced into the stomach, and this is usually done by eating animal flesh containing them, either raw, or cooked insufficiently to kill or arrest the further development of the embryo.

Tænia solium* usually arises from eating

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* The *Tænia solium* in its embryonic state is known as the *Cysticercus cellulosæ*, and dwells in the intermuscular connective tissue and other parts of the pig.

imperfectly cooked pork, and *Tænia saginata* from the flesh of the ox. Children are said to have acquired the latter from eating grated raw-beef given them by medical prescription. *Tænia solium* is only found in the human small intestine, usually in its upper third, into the mucous membrane of which the head is very firmly fixed, the neck and the first segment of the worm lying coiled up in a mass around the head. The worm may reach to the lower third of the small intestine, but rarely to the cæcum. *T. saginata*, also peculiar to man, differs from *T. solium* in its head not having a circlet of hooks, in place of which it has a small frontal sucker besides the four powerful sucking discs on its head, which is far larger than that of *T. solium.* It is a much larger, stronger, thicker, and fatter worm, and may grow to a length of nearly 20 yards.

The only other tapeworm frequently found in man is the *Bothriocephalus latus.* It is not, however, like the two preceding, peculiar to the human being, as it has often been met with in dogs. It is the longest of all the tapeworms that inhabit the intestine of man, and may reach 25 yards in length. The head differs in form from that of either of the preceding. It is almond-shaped, and has a long elliptical sucker on each side. It has a dull bluish-grey colour when fresh. It differs further from *T. solium* or *T. saginata* by having its genital orifice in the centre of the brood surface of the segments, not on the margin, and this is always on the same ventral aspect. The uterus, distended with eggs, appears in the mature segments, which are nearly square, or as *broad as they are long*, as a *central* rosette-like group of pouches (Fig. 11).

The eggs, *if left in water* for some months, develop within them a six-hooked embryo. They open by casting off a lid, and then the embryo swims about by means of a ciliated envelope, which is thrown off after four to six days, retaining still a transparent albuminous coat. Its further fate is unknown, but it is thought highly probable that its intermediate state of development takes place in some aquatic animal. Lately the scolices have been found by Braun, of St. Petersburg, in the muscles, liver, and organs of generation of the pike, trout, and eel-pout, and by causing cats and dogs to feed on these the fully developed tapeworm has been produced. It would, therefore, seem probable that man might be infected by eating such fish raw or insufficiently cooked. This tapeworm has not been found except in Europe, and it is especially frequent in *Western* Switzerland, and in Poland, parts of Sweden, Finland, St. Petersburg, and the Baltic Provinces.

The **symptoms** due to the presence of one or more tapeworms in the intestinal canal may be so insignificant as to escape notice, especially in the case of children, and their existence may not be suspected until its segments are discovered in the motions. In many cases, however, troublesome symptoms due to the presence of the worm in the small intestine make themselves manifest. Vague digestive and nutritive disturbances, unpleasant feelings in the abdomen, sometimes colicky pains are complained of, most troublesome during fasting, or after particular articles of diet. These are relieved by eating, and especially by certain kinds of food. Sensations of ravenous hunger, feelings of fainting, a sense of distension in the abdomen, diarrhœa alternating with constipation, a feeling as if some foreign body were moving about in the intestines—all these have been complained of in connection with tapeworm. The following reflex phenomena have also been noticed :—Itching about anus, tickling of the nose, salivation, vomiting, headaches, singing in ears, palpitation, gastralgia, and many convulsive nervous affections, such as chorea, cramp, etc.

So far as diagnosis is concerned, it is commonly by the observation of segments of the worm in the motions that we conclude a patient has tapeworm. If, however, we have not had an opportunity of ourselves seeing any of these segments, a mild purgative will usually bring away some, if a tapeworm really exists in the small intestine. It must be remembered that it is not uncommon for patients who pass large shreds and strings of tough mucus owing to chronic catarrh of the large intestine to regard these as portions of tapeworm.

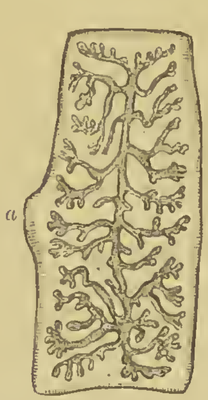

Fig. 9.—Ripe Segment of *Tænia solium.*
a, Genital pore. (Magnified 6 diam.)

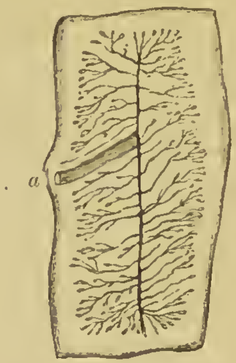

Fig. 10.—Ripe Segment of *Tænia saginata.*
a, Genital pore. (Magnified 6 diam.)

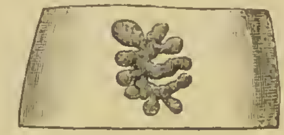

Fig. 11.—Ripe Segment of *Bothriocephalus latus.* (Magnified 6 diam.)

As *Tænia saginata* is said to be much more difficult to expel than either *Tænia solium* or *Bothriocephalus latus*, it is desirable before beginning the treatment that we should ascertain which kind we have to deal with. The segments of *Tænia saginata* (Figs. 10, 12, A) are much stronger, thicker, and more opaque than those of *Tænia solium* (Figs. 9, 12, D). If we spread out some of the segments on a glass plate, and allow them to dry, we can distinguish the smaller number of lateral branches going off from the uterus in the *T. solium*, from the numerous lateral branches—from 15 to 20—in the segments of *T. saginata*.

The ripe segments of *Bothriocephalus latus* are almost square, and the uterus in the centre is seen in the form of a brown rosette (Figs. 11, 12, B, C).

The heads of these three kinds are also here figured (Fig. 12):—

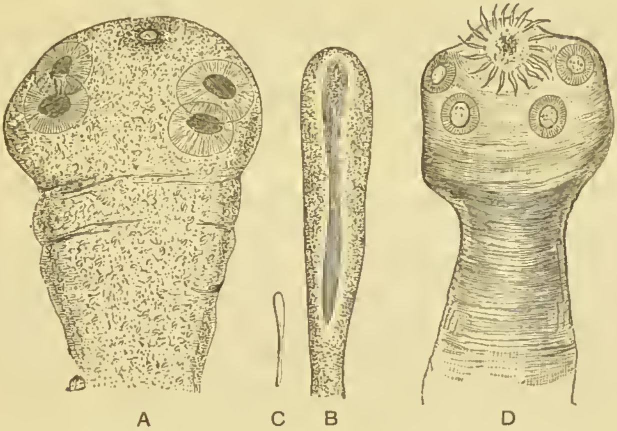

Fig. 12.—A, Head of *Tænia saginata*. B, Head of *Bothriocephalus latus*, seen from the side (magnified). C, The same seen from above (natural size). D, Enlarged Head of *Tænia solium*.

A cure can only be said to be radical when the head is found in the evacuations, or if more than one worm exist, the heads of each.

Occasionally the whole worm is expelled in one piece, as a densely-coiled mass, and the head will be found by tracing the segments, from larger to smaller, until at last we find the smallest segments terminating in the slender neck and broader head of the worm. More frequently we find the smaller segments broken, and then the evacuation must be washed several times with water, by pouring clean water upon it again and again, allowing it to stand each time for 10 minutes, and then pouring it off till it is scarcely coloured. Then we should transfer the worm, coil by coil, to a vessel of clean water, and search for the head amongst the residuum of single segments and smaller fragments. If the head is not seen, it is to be feared it remains, not dislodged, in the small intestine. We must then wait for three months (the worm requires eight to ten weeks to arrive at maturity), and see if any fresh segments are expelled. If no segments have been expelled we may conclude that the head was discharged, although not found, and that the cure is complete.

After taking a vermicide and vermifuge dose, it is a good plan to direct the patient to pass his evacuations into a vessel three parts full of warm water; this will greatly facilitate the search for the head of the worm.

Before administering the remedy by which we hope to procure the expulsion of the worm, some **preparatory treatment** is advisable in order to give the remedy the best chance of success. It is obviously desirable to clear away from the intestine, as much as possible, all the solid fæculent matter that may be present there, so that the remedial agent shall come in contact with the worm, diluted only with the fluid secretions of the intestine. We may also hope that the worm when detached will thus be expelled more quickly, and as we should have only fluid evacuations to examine, we should have less difficulty in discovering the head in them than in a mixture of solid and fluid excrement. We should therefore administer gentle laxatives for two or three days as a preparatory measure; not strong purgatives which break the worm, and cause portions of it to come away, so that what remains may be more difficult to dislodge.

We may give from 1 to 2 drams of sodium sulphate with 1 or 2 drams of syrup of senna in 1½ ounce of cinnamon water each morning fasting, and an enema of soap and water each night. The food during these two or three days should be mostly fluid and concentrated, not leaving much undigested residue, such as the lean of meat, meat broths and soups, with bread crumb, fruit jellies, milk diluted with water, tea, coffee, wine and water, or mild beer.

The patient's bowels having been completely evacuated the evening or day before, and no solid food taken afterwards, on or soon after waking the next morning the vermicide medicine should be given. The following are the drugs that have been found most successful in getting rid of *Tænia* :—

Male fern (filix mas) ; *Kousso, or Cusso* (the dried panicles of Brayera anthelmintica) ; *Pomegranate* (the dried bark of the root of Punica granatum) ; *Pelletierine* sulphate and tannate (an alkaloid obtained from pomegranate) ; *Kamala ; Turpentine ; Pumpkin seeds* (the seeds of the Cucurbita pepo) ; *Thymol.*

The **filix mas,** or male fern, is an efficient Tæniacide. It has been said to be more poisonous to the *Bothriocephalus* than to the *Tæniæ.* The liquid extract is usually used, and it is important that it should be as freshly made, from the fresh root, as possible.

It may be given in capsules, each containing 15 minims. A capsule should be given every quarter of an hour until four to six have been taken. They may be washed down with a little *café au lait*, or the extract may be made into an emulsion by rubbing down 60 to 90 minims with half a dram of compound tragacanth powder, and slowly adding 2 ounces of peppermint water. One-third of this draught should be taken every quarter of an hour.

Or the liquid extract may be made into a confection by rubbing up 60 to 90 minims with 4 drams of powdered male fern root, and a sufficient quantity of honey. A sixth part should be taken every quarter of an hour.

If, after two hours, no aperient action has followed these doses, a purgative should be given—a tablespoonful of castor oil is the best, which may be repeated in half an hour if necessary. A smaller dose of the male fern extract may be given to children, but we believe that when it fails to bring away the whole of the worm it is often because an insufficient dose has been given.

Some prefer to combine an aperient with the oil of male fern, and for this purpose capsules are made, each containing 7½ minims of extract of male fern and a grain of calomel. Sixteen of these are taken for a dose, two every ten minutes.

Bamberger* is reported to order the large dose of 5 drams of the fresh ethereal extract, with an equal quantity of castor oil at one dose!

Kousso, or Cusso, an ancient Abyssinian remedy, has been warmly advocated by Heller, and it is, no doubt, an efficacious vermicide. There is an infusion in the B.P., the dose of which is 4 to 6 ounces; but the compressed drug enclosed in gelatine capsules is said to act better. If the infusion is used it should not be strained from the herb, but the whole should be swallowed; 2 to 4 drams may be thus taken infused in 4 ounces of boiling water. It should be followed in less than two hours by a purgative. It is a very unpleasant drug to take, and not infrequently causes nausea and vomiting; it is also costly, hence it is not largely used in England.

Heller states that 5 drams are needed for expelling the *Tænia solium* and 7½ drams for the *Tænia saginata.*

Prof. Widerhofer † makes an electuary by mixing 2½ drams of powdered kousso with 6 drams of honey, and gives this in two doses; and Bamberger occasionally combines kousso with male fern, mixing 75 minims of extract of male fern with 2½ drams of powdered kousso, enclosing this in 30 capsules, and giving four every quarter of an hour.

Koussin, an alcoholic extract from kousso, has been found successful in doses of 30 grains, and it has the advantage of not exciting nausea.

Pomegranate.—The bark of the root of Punica granatum has been highly extolled by Küchenmeister. He directs that 3 ounces of the fresh bark should be macerated in 12 ounces of water for twelve hours, and the infusion concentrated to one-half. It must be taken within an hour in three or four doses, and if no purgative effect follows in an hour or two, a dose of castor oil must be given. There is a decoction and an extract in the B.P. The former is about a quarter the strength of Küchenmeister's infusion, and the dose is 2 to 4 ounces.

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* "Formulaire de la Faculté de Médicine de Vienne," by Dr. T. Wiethe, 1888, p. 91.

† "Formulaire de la Faculté de Médicine de Vienne."

It has been objected to this drug that it causes much abdominal discomfort, together with nausea and vomiting, and of late years an alkaloid derived from the bark of the pomegranate root—the **tannate of pelletierine**—has been used in its stead. This is a yellowish white powder, insoluble, or almost so, in water, and is on that account better suited for a vermicide than the sulphate, which is soluble in water and, therefore, more likely to be partly absorbed in the stomach. The dose is 8 to 12 grains, given fasting, mixed with a little water. A tumblerful of water should be drunk 10 minutes afterwards, and half an hour later an aperient should be given—either a tablespoonful or two of castor oil or 1 or 2 ounces of infusion of senna. This has proved a most efficacious poison to the tapeworm, and Dujardin-Beaumetz found that it brought away the worm with its head in 90 per cent. of the cases in which he had given it; but he hesitates to recommend it in children for fear of its possible toxic effects.

Turpentine has been found an efficient remedy for tapeworm. It must be given in a large dose, and is best combined with an equal quantity of castor oil so as to insure its being carried quickly through the bowel, and not absorbed into the circulation, in which case it would be likely to give rise to troublesome renal irritation.

The mixture usually ordered consists of 1 ounce of oil of turpentine and 1 ounce of castor oil made into an emulsion with yolk of egg; but this is very disagreeable to take, and if we select turpentine as a tæniacide, it is best to get an ounce each of turpentine and castor oil enclosed in about 30 gelatine capsules. These may be swallowed one after the other in a few minutes, the patient washing them down with mouthfuls of warm milk and water. If this dose be taken fasting it will usually act quickly as a purge, and bring away the dead worm.

Kamala.—This is an orange-red powder probably of a resinous nature, and consisting of the glands and hairs from the capsules of an euphorbiaceous plant. It is quite insoluble in water. It should be given in doses of 30 to 100 grains, according to the age and vigour of the patient, and usually two doses are given at an interval of half an hour. It may be made into a confection with honey, or it may be suspended in gruel or chocolate. An aperient should be given within two hours. It is usually efficacious in expelling the worm.

Davaine prefers the **tincture** made by macerating 1 part of kamala with 2 of rectified spirit for two days, and filtering. A dram of this with a dram of syrup of orange-peel and an ounce of cinnamon water should be given every hour for four doses, and if the worm is not expelled within two hours of the last dose an ounce of castor oil should be given.

Pumpkin seeds have been found a mild and useful tæniacide for children, and not unpleasant to take. Their efficacy appears to depend on the presence of a resin in the perisperm, to which the name *peporesine* has been given. About an ounce of the seeds may be given a child for a dose, and they may be pounded up with sugar and honey into a paste, which children will readily eat.

Thymol.—This drug has recently been stated to be efficacious in the destruction of tapeworm.

The advantage is claimed for it over most of the other remedies that it does not cause any gastric or intestinal disturbance; that it both kills and expels the worm; that, compared with other remedies, its administration is rapid and simple. It is admitted, however, that, given in doses sufficient for the purpose in view, it produces a certain amount of depression, the pulse becomes more frequent and more feeble, the respirations and the temperature are lowered; it is, therefore, necessary to accompany its administration with some stimulant such as brandy or whisky.

Dr. Numa Campi has given it in the following manner:—In the morning an ounce of castor oil, and then during the day 10 grains of thymol every quarter of an hour, and 20 minutes after the last dose again an ounce of castor oil. A few minutes afterwards a *tænia medio-cannelata* was expelled entire. We are disposed to consider these doses large, and we should prefer in trying this drug, which is somewhat caustic, to give not more than 3 to 5 grains for a dose, and we should make this into pills with a little powdered soap and spirit. Two pills, with 2½ grains in each, might be given every 20 minutes with a wineglassful of warm milk and water and a dessertspoonful of brandy. The patient should, of course, take nothing in the way of food during the time he is taking the thymol. Other antiseptic substances have been used to kill tænia, and, it is stated, with success—*e.g. naphthaline*, in doses varying from 2 to 20 grains, mixed with powdered sugar, twice a day; and *creolin*, 15 grains in a capsule three times a day.

The following has been stated to be an efficacious tæniafuge:—

℞ Croton oil	1 drop.
Chloroform	1 dram.
Glycerine	10 drams.

Half to be taken fasting, and repeated in half an hour. Abstinence from food the evening before.

Chloroform in 20-minim doses alone, or, better, mixed with simple syrup, has also been said to prove efficacious in getting rid of tapeworm. If it escaped complete volatilisation in the stomach and reached the small intestine, it might intoxicate the worm, and so detach the head.

It must be borne in mind in administering drugs for tapeworm that the object is to poison and kill, or paralyse the worm, so that it may relax its hold on the intestinal walls, without *poisoning* the patient, and those remedies, therefore, which are insoluble, or very slightly soluble in water are best suited to our purpose.

Infusions and decoctions which may be largely absorbed in the stomach are objectionable, for two reasons—first, the absorbed substances may produce disagreeable toxic effects on the patient; and, second, if a portion is absorbed in the stomach it fails to reach the worm in the small intestine. Hence we see nearly all the successful tæniacides are either oils, or resins, or oleo-resins. The **prophylaxis** consists in scrupulous cleanliness and care in the preparation of food, which should be completely cooked; raw and underdone meats being avoided. And in association with domestic animals great care should be observed.

Ascaris lumbricoides.—The *lumbricus*, or round worm, inhabits the small intestine, but wanders sometimes to other parts. It is cylindrical, usually of a light brownish or dirty white colour, and tapers at each end. The female is usually from 6 to 12 inches long, the male is smaller. Five or six are often found together, and occasionally a much larger number. The mature female produces an enormous number of eggs, which are discharged in the evacuations. These eggs have great power of resisting destructive agencies, and probably retain for years the capacity of development. We have no certain knowledge of the complete life history of this parasitic worm, or how man becomes infected; but it seems most likely that the eggs gain entrance to the human intestine in contaminated drinking water. It is much more common amongst the poor and uncivilised, than amongst the better and more civilised classes, who are trained to habits of cleanliness, and whose food is more carefully selected and prepared. They are also far more common in children than adults.

The presence of these worms in the intestine is usually discovered by the appearance of one in the motions, or they may wander into the stomach and be vomited, or occasionally they have appeared at the nostrils. Children are, however, often suspected of having worms when they present certain symptoms that are otherwise difficult to account for, such as itching at the nose, capricious appetite, foul breath, colicky pains, with swelling of the abdomen, emaciation, nocturnal restlessness, bad dreams, and grating of the teeth in sleep. Convulsions and epilepsy have been occasionally caused by them.

The **treatment** of these worms is simple. The best vermicide for them is *santonica*, the unexpanded flower-heads of *artemisia maritima*, or its active principle **santonin.** It kills them speedily and certainly. The drug must, however, be used with great caution in very young children and infants, as it has been known to cause toxic symptoms which have even proved fatal, viz. purging and vomiting, with convulsions and coma. *Santonin* is very sparingly soluble in water, and is often given in lozenges each containing 1 grain. The dose is 2 to 3 grains given fasting or after a mild purge, and in combination with some aperient such as castor oil. Professor Heller objects to castor oil as a medium for the drug, as, he says, it has the property of dissolving santonin, and, therefore, promoting its absorption and the production of toxic effects. Küchenmeister, however, maintains that it acts better when given with castor oil than in any other way, and Professor Whitla confirms this observation, "after seeing its administration in some thousands of instances in the practice of a children's hospital. Unpleasant symptoms were never observed, though the drug was given in full doses; *the oil appears* to lessen very considerably the risk of any evil effects." He gave 2-grain doses to children two years old at bed-time, mixed with a large teaspoonful of castor oil, and more oil in the morning if necessary. If castor oil is objected to it can be given mixed with 2 or 3 grains of calomel and a little powdered sugar. Or lozenges may be made each containing 1 grain of calomel and 1 grain of santonin, two or three of which would be a dose. For older children from 5 to 10 years of age the following mixture may be prescribed :—

℞ Santonini	6 grains.
Ol. ricini	4 drams.
Syr. aurant.	3 ,,
Mucil. acaciæ	6 ,,
Aquæ carui	ad 3 oz.

M. f. mist. Take half in the morning fasting.

One of the bye-effects of santonin, coming on shortly after the dose is given, is yellow vision, and the urine is often stained yellow or orange. **Kamala** is also efficacious in the cure of lumbrici.

Oxyuris vermicularis, or **threadworm.**—This is a small, white, round worm, tapering at each end. The female, which is longer than the male, is about $\frac{2}{5}$ inch long, the male only one-third or half that length. The posterior extremity of the female is drawn out into a fine pointed tail, that of the male is blunt and curved upward.

This worm, from the egg to maturity, spends its whole life in the human intestine. It is only found in the human intestine from the jejunum to the anus. It is an error to suppose, as has often been stated, that this worm specially inhabits the rectum. The young animals and the mature males chiefly inhabit the small intestine; the impregnated and mature females the *cæcum.* In the *cæcum they are most abundant,* and the females gradually collect together there until mature, and crammed with eggs. They are prone to collect in the *vermiform appendix.* Heller has seen with the naked eye as many as nineteen females and nineteen males in the appendix. They then slowly pass down the large intestine, and finally deposit the chief part of their eggs in the rectum. They sometimes even crawl out on the moist skin around the anus. Finally, both males and females are mechanically expelled with the fæces, and perish. It is generally believed that the ripe eggs must be swallowed, and their shells acted upon by the gastric juice of the stomach in order that the embryo may be set free so as to infect the human intestine. But certainly one observer has seen the embryos escaping from the eggs in mucus taken from the rectum.* But this is regarded as a very exceptional circumstance, and in general the embryos are first set free in the stomach, and at once pass into the upper part of the small intestine. They arrive quickly at maturity. Young worms have been expelled fourteen days after swallowing the eggs. They are often excessively numerous, covering the whole mucous membrane of the intestine.

As to the **cause** of the presence of these worms in the intestine it must be concluded that the ripe eggs are always swallowed, and that it is a consequence of want of care and cleanliness. Scrupulous cleanliness is needed to prevent self-infection. As the eggs soon perish in water, it is not likely that they are introduced in drinking water, but it has been suggested that, under favourable conditions, they may be transmitted in the dust of the atmosphere. They occur at all ages, but are more common during childhood.

The particular and characteristic symptom these worms give rise to is irritation of the lower part of the rectum just within the sphincter. They descend to this part to lay their eggs, and their active boring movements cause an intense tickling and itching almost intolerable. This is especially noticed at night in bed. In *females*, the worms that have escaped from the rectum may creep between the vulva and into the vagina, or may be carried there by the hands in scratching, and there by their wriggling, boring movements they set up great irritation of the sexual organs, and may lead to masturbation. By exciting sympathetic irritation of the generative organs they have been known to cause troublesome erections, nymphomania, pruritus, etc.

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* Vix, quoted in Von Ziemssen's ".Cyclopædia," vol. xii. p. 755.

The successful **treatment** and complete dislodgment of these parasites is often difficult; for not only have they to be dislodged from the rectum, which is not very difficult, but they have to be destroyed in their favourite abiding-place, the cæcum, and in the appendix vermiformis.

To dislodge them from the rectum the best plan is to administer daily an injection which shall wash away the worms and their eggs, together with the mucus in which they are embedded. Various substances have been recommended to be used for these enemata—as infusion of quassia, decoction of eucalyptus, lime water, the *aloes* enema of the B. P. Salt and water (two teaspoonfuls to a pint of water, improved by the addition of half a teaspoonful of bicarbonate of soda); natural sulphur water; glycerine and water (equal parts). Heller prefers an enema of soap and water, 2 or 3 grains of castile-soap to each ounce of distilled or rain water. This is without any unpleasant action on the intestinal mucous membrane, while it quickly destroys both worms and eggs. He recommends the adoption of Hegar's method of washing out the whole length of the large intestine by means of a long flexible tube and a syphon arrangement, the patient being placed on his hands and knees. After the bowel has been freed from fæces, in the adult (for whom this treatment is only practicable) the bowel may be washed out with large quantities of soap and water—as much as can be tolerated without exciting persistent straining efforts —from 3 to 6 pints, introduced slowly. This method is only necessary in very troublesome cases.

Excellent results have been said to be obtained by enemata of naphthaline (15 to 20 grains) in olive oil (1½ to 2 ounces) in young children. Larger doses must be employed for adults.

Injections of cod-liver oil, pure or made into an emulsion with yolk of egg, have also been found useful, and they have the advantage of being non-irritating.

The introduction into the rectum of mercurial ointment, diluted with vaseline, which can be passed in with the finger or on a small piece of sponge, or a **mercurial suppository**, is a good plan in cases where the employment of enemata is difficult. The white precipitate ointment should also be applied freely to the external parts to destroy ova or wandering parasites. If there is much local irritation still unrelieved, the anus and the mucous membrane just inside it may be brushed with a 4 per cent. solution of hydrochlorate of cocaine.

Dr. Archambault, when he finds enemata of 4 to 6 ounces of lime water fail, uses solutions of perchloride of iron (5 per cent.) every night for five to ten nights, or a small lavement (3 ounces) containing $\frac{1}{4}$ grain of corrosive sublimate.

With regard to internal remedies, the free administration of purgatives is, no doubt, very useful; they mechanically sweep away the parasites. In adults we may give a combination of the sulphates of magnesia and soda, a teaspoonful of each dissolved in a tumblerful of cold water, early in the morning, repeating the dose every hour until free purgation is established. In children a combination of calomel, jalap, and scammony answers well. The following powder should be given at bed-time or in the early morning:—

℞ Calomel, 2 grains.
Pulv. scammonii comp., 10 to 20 grains (according to age).

Or two grains of calomel may be given, with 10 to 30 grains of confection of scammony, at the same hour.

Or the effect of **sulphur** may be tried as an aperient, and this, being insoluble, will certainly come in contact with the worms in the cæcum. Half or a whole teaspoonful of the confection of sulphur should be given every night, and an ounce of the scammony mixture (B.P.) the following morning. By means of purgatives internally, and diligently washing out the rectum with enemata, these parasites can be kept under, and if no reinfection takes place they may in course of time be got rid of.

Dr. Sydney Martin has had good results from the use of rhubarb in small doses, and the worms have been so freely expelled that there has been no need of injections. He gives the following dose three or four times a day :—

℞ Tinct. rhei	3 minims.
Magnesii carb.	3 grains.
Tinct. zingib.	1 minim.
Aquæ	ad 1 dram.

M. f. dosis.

The regular use of tonics of vegetable bitters and iron will further this result, and so will the use of cod-liver oil, in thin and strumous children. Twenty or 30 minims of the syrup of the phosphate of iron in two teaspoonfuls of infusion of calumba may be given to children one hour after food three times a day, or half a teaspoonful of vinum ferri citratis to quite young infants, or a grain or two of reduced iron in a powder with sugar.

In adults we have found the continued use of the following pill useful in preventing the reappearance of the parasite :—

℞ Ferri sulphatis exsicc....	1 grain.
Quassiæ pulv.	2 ,,
Saponis	1 ,,

M. f. pil. Two or three to be taken thrice daily an hour after food.

The ordinary vermicides seem to have little effect on these parasites, partly because some of these are absorbed before they reach the cæcum, and partly because these worms seem to be able to resist the action of such agents. Heller states that he has found them *quite lively* under a dressing applied for venereal disease consisting of a fairly strong solution of carbolic acid.

The *prophylactic* measures are too obvious to need mention.

The **trichocephalus dispar**, or long thread-worm, which is also found inhabiting the cæcum of man, is rarely seen in England. It is attended by no special symptoms, and is not amenable to any particular treatment.

The **anchylostomum duodenale**, which is very prevalent in Egypt and in most tropical countries, is not known in the north of Europe, nor have any definite rules for its treatment been established. Federici has, however, stated that *thymol* acted successfully in killing the parasites in some cases which occurred among the miners of the St. Gothard Tunnel.

ADDITIONAL FORMULÆ.

For tapeworm.

℞ Kamalæ pulv., 3 drams.

Divide in pulv. 3. To be taken fasting, a powder every half hour. (*Bamberger.*)

Another.

℞ Rad. cortic. granati, 1½ to 2½ oz.

Macerate for twenty-four hours, then boil in—

Aquæ destill., 12 oz.

Evaporate to 6 oz. and add—

Extr. filicis maris æther., 2 drams.

A third part to be taken (fasting) every half hour. Take a saline aperient the night before, and no food other than soup or tea or a salt herring! (*Bamberger.*)

Another.

℞ Kousso pulv., 5 drams.

Infuse in boiling water (half a pint) for a quarter of an hour, strain, and add half a teaspoonful of lemon juice. To be taken fasting. (*Bamberger.*)

It will be necessary to give one or two tablespoonfuls of castor oil if the vermicide does not act as an aperient.

Another.

℞ Extr. filicis maris æther., 30 grains.
Pulv. radicis filicis maris, 30 grains.
Confectionis rosæ, q.s.

Ut f. pil. 10. From two to four pills every half hour. (*Bamberger.*)

For children.

℞ Kousso pulv., 2 drams.
Extr. filicis maris æther., 1 dram.

Enclose in twenty-four gelatine capsules. Four to be taken every quarter of an hour. (*Bamberger.*)

Draught for tapeworm.

℞ Ext. filicis liq., 1 dram.
Ovi vitellum, 1 dram.
Aquæ chloroformi et syrupi simp., q.s. ad 2 oz.

M. f. haust. To be taken in the morning. (*Whitla.*)

Confection for children.

℞ Pulv. kamalæ, 5 drams.
Ext. filicis maris æther., 2½ drams.
Syrupi aurantii, q.s.
Pulv. acaciæ, q.s.

Ut ft. electuarium. To be given in cachets. (*Monti.*)

Pills for children.

℞ Extr. radicis granati recentis, 40 grs.
Extr. filicis maris, 40 grs.
Pulv. radicis granati, 8 grs.

Ut f. pil. 40. Half an hour after giving the child a cup of milk, give ten of these pills every half-hour, keeping ten in reserve in case some of the others should be vomited. A few hours afterwards a dose of castor oil. (*Fleischmann.*)

Jelly for children.

℞ Extr. filicis maris liq., 1 dr.
Hydrargyri subchlor., 6 grs.
Sacchari alb., 2 drams.
Gelatin, q.s.

Ut fiat electuarium. Quarter of this may be given every half-hour. (*Duchesne.*)

For lumbrici.

℞ Santonini, 8 grains.
Ext. spigeliæ fluid., 6 drams.
Ext. sennæ fluid., 2 drams.

M. A teaspoonful for a dose for a child of five years. (*Prof. Lewis Smith.*)

Enema for ascarides.

℞ Aloes barbadensis, ½ dram.
Potassii carb., 15 grains.
Dec. amyli, 10 oz.

M. f. enema. (*Guichon.*)

Vermicide and purgative combined with chloral hydrate.

℞ Chloral hydrate, 18 grains.
Extr. filicis maris, 30 grains.
Ol. crotonis, 1 or 2 drops.

M. enclose in capsule. (*Rothe.*)

Powder for lumbrici.

℞ Santonini, 1½ grain.
Hydrarg. subchlor., 2 grains.
Sacchari lactis, 15 grains.

M. f. pulv. To be given in honey to an infant two years old.

Enema for ascarides.

℞ Liquor. calcis, 4 oz.
Dec. althææ, 1 oz.

M. f. enema. (*Barthez.*)

CHAPTER XIV.

DISEASES OF THE INTESTINES—THE TREATMENT OF PERITONITIS.

ACUTE PERITONITIS usually Secondary to Traumatic Lesions or Visceral Diseases—Sometimes Local and Partial. *Symptoms* of Acute General Peritonitis. *Treatment*—Blood-letting—Leeches—Cold Applications—Opium—Rest—Mode of Feeding—Nutrient Enemata, etc.—Treatment of Vomiting and Tympanites—Aperients to be avoided—Quinine—Influence of Opium—Cautions to be observed in its Use—Large Doses in Puerperal Cases—Reaction against its indiscriminate Use and Advocacy of Saline Aperients in early Stage of Disease—Enemata of Warm Water—Calomel. *Surgical* Treatment. TUBERCULAR PERITONITIS — TABES MESENTERICA — Latency and Obscurity of Peritoneal Tubercle. *Symptoms*—Ascites—Sacculated Exudation. *Treatment*—Spontaneous Cure—Local Applications—Iodine—Mercury—Cod-liver Oil and Iodoform. *Laparotomy*, when advisable. Additional Formulæ.

Acute peritonitis may be primitive or secondary, partial or general. *Primitive* peritonitis from exposure to cold, and hence often spoken of as rheumatic peritonitis, is extremely rare; still it does occasionally occur.

Peritonitis is, however, most commonly met with as a consequence of some other disease or injury. Wounds and contusions of the abdomen, accidental or surgical, may give rise either to partial or general peritonitis. The most common cause, however, of peritonitis is some disease of the abdominal viscera, such as simple perforating ulcer of the stomach or duodenum; tubercular, typhoid, dysenteric, or cancerous ulceration of the intestine; disease (abscess, ulceration, etc.) of the vermiform appendix or cæcum; intestinal obstruction; diseases of the liver, such as abscess of liver or cysts, or acute hepatitis; ulceration and perforation of the gall-bladder or bile ducts; diseases of the pelvic viscera, as inflammation of the uterus (puerperal fever), Fallopian tubes or ovaries, or disease of the bladder.

Acute peritonitis also occurs in connection with certain *general* diseases, as in Bright's disease, in septicæmia, and in some exanthemata. When it accompanies some of those lesions of the abdominal and pelvic viscera it is local and partial, and limited to the vicinity of the visceral disease causing it; the same is also frequently the case when it is due to external injuries and surgical operations, but when it is caused by perforation of the stomach, or any of the hollow viscera, and their contents escape into the peritoneal cavity, it is usually severe and general.

Tubercular peritonitis is a special form of peritonitis which will be considered apart.

The characteristic **symptoms** of acute diffuse peritonitis are these: *very severe abdominal pain and tenderness*—so severe that the patient dreads the slightest touch or movement, and, therefore, lies on his back with his knees drawn up so as to relieve the abdominal walls as much as possible and keep off the pressure of the bed-clothes. *Abdominal distension and tympanites:* This is believed to be due to the inflammation involving the external coat of the bowel, or at any rate leading to such a disturbance of innervation of the muscular coat that a sub-paralytic condition of the intestinal walls is produced, so that they become greatly dilated; hence the tympanites. Hence also another symptom that almost invariably attends acute diffuse peritonitis (unless it should happen to have supervened on some other affection which has been attended with diarrhœa), and that is absolute *constipation.* Owing to the great pain attending any movement of the intestines or abdominal wall, and owing also to the pressure on its lower surface of the distended intestines, the *diaphragm* moves but little in respiration; the inspirations are therefore very shallow, and the *respirations* are *greatly quickened*, and *wholly*, or *almost wholly*, *thoracic.*

The digestive functions are practically suppressed. There is entire loss of appetite; the tongue and mouth are red and dry; there is thirst, nausea, and vomiting, and the matters vomited have often a *green colour.* The countenance is usually pale, the features pinched, and the expression anxious. The pulse is small, hard, and rapid, of the kind that is termed wiry. The skin is dry and hot, and the temperature raised often to 104° F., or even 105°. The urine is high-coloured and scanty, and passed with pain and difficulty. If much serous effusion should occur later on, percussion will disclose some dulness in the flanks.

In the gravest cases, viz. those due to perforation of the stomach or intestines, there is usually marked collapse and speedy death.

When the exciting cause has not been of such extreme gravity the symptoms may subside, and the patient recover. Adhesions between coils of intestine, or between the walls of the intestine and the abdominal walls, are apt to be left behind, and habitual constipation may thus originate.

In some cases the peritonitis is *latent* and not disclosed during life by any marked or characteristic symptoms.

The history and symptoms of local partial peritonitis, as, for instance, in the right iliac fossa from typhlitis, are usually merged in those of the disease of which it is a complication; these have been discussed under *Appendicitis.*

We may now proceed to consider the **treatment** of acute peritonitis. In all cases the cause must be searched for as diligently as circumstances permit of.

The suggestion that in a case of acute peritonitis resulting from a perforating gastric ulcer the stomach should be washed out with the stomach pump in order to prevent further extravasation of its contents into the peritoneal cavity is scarcely a practicable one. Generally the patient is in a state of collapse, when such a procedure would be impossible; and even if otherwise, the disturbance of the patient which such a procedure would necessitate might cause more harm than good, and lead even to more injury to the peritoneum than a mode of treatment calculated to keep the stomach perfectly still and at rest.

In cases in which acute peritonitis is dependent on intestinal obstruction, or on the entrance of septic substances into the peritoneal cavity, and when the exudation is therefore purulent, surgical intervention, and the opening of the peritoneal cavity by *laparotomy*, and its irrigation by warm water or some aseptic solution, may be the best mode of treatment—a procedure to the consideration of which we propose to return.

We are not disposed to recommend the letting of blood in any of these cases, but the advantage of the local abstraction of blood by leeches, and its influence in relieving pain, is generally admitted. In an acute peritonitis in which no definite and obviously removable local cause can be discovered, the treatment may be commenced by the application of from ten to thirty leeches to the abdominal surface, and particularly to that part which seems to be especially painful; this may be followed by the application of a light hot linseed poultice sprinkled well with laudanum. Ice-cold compresses repeated every ten minutes, or the application of cold by means of Leiter's tubes, have been found of value by some physicians, especially in Germany, but in England patients rarely seem able to bear them, and warm applications are much more grateful.

In robust or previously healthy subjects it is quite possible that if the case be seen quite early the treatment by ice-cold compresses may be of great utility, but in order that they shall produce a good effect it is necessary that they should be renewed *at short and regular intervals with great assiduity.*

In order to relieve the pain and vomiting, and to keep the bowels perfectly at rest, which is in most cases the great indication, opium must be given: 1 grain of the extract or powder may be given every hour until the patient is brought distinctly under the influence of the drug, *i.e.* is free from pain. In cases of gastric ulcer and perforation, when opium cannot be given by the mouth, and in cases of obstinate vomiting, a few ¼-grain doses of sulphate of morphia may be given hypodermically every two hours, or small starch enemata each containing 20 minims of tincture of opium may be administered every hour. It is important to remember that opium is very badly borne by persons with Bright's disease, and it will be rarely advisable to give this drug, even in small doses, in cases of peritonitis occurring in the course of that affection.

It is scarcely necessary to say the patient must be kept absolutely at rest; indeed, all movement is so painful that he will rarely show any indisposition to obey this injunction. A cradle may be arranged over the body to keep off the weight of the bed-clothes. During the acute stage the digestive functions of the stomach are in abeyance, and it is useless to attempt to give nourishment by the mouth; the thirst should, however, be relieved by sucking quite small fragments of ice. Nutrient enemata and stimulants will in most cases have to be given by the rectum to maintain the patient's strength and prevent collapse. When the vomiting has passed away a little iced milk and water, or thin gruel, or cold consommé, may be given by the mouth, and if the other severe symptoms subside a gradual return to stomach feeding may be adopted, except in cases of perforating gastric ulcer, and in the very rare case of recovery from this form of acute peritonitis (and some cases do recover) rectal feeding must be maintained for some weeks.

If the vomiting is very troublesome and there is no reason to fear the existence of gastric perforation, we may endeavour to relieve this symptom by table-spoonful doses of lime water, or small effervescing draughts containing 4 or 5 minims of dilute hydrocyanic acid in each, or by creasote in 1-minim doses shaken up with an ounce of lime water. Distress from excessive tympanites may best be relieved by passing a long tube into the rectum, or, if the acute stage has passed away, by the administration of a turpentine enema and the application of turpentine stupes.

Aperients are rarely advisable: as the inflammation subsides and the bowels recover muscular tone, spontaneous discharge of their contents will take place, and if this should be too long delayed it may be hastened by the administration of enemata of olive oil mixed with soap and water. In protracted cases of a low adynamic type full doses of quinine may be needed to maintain the patient's strength.

Also, when the peritonitis is *local and partial* the application of leeches and the use of opium, especially its external local application, are the best means of affording relief.

These are the measures which should be generally adopted in the management of cases of acute peritonitis. Some of these, however, require fuller discussion.

And first, with regard to the treatment by **opium.** No doubt this drug has a remarkable action through the vaso-motor nerves on the capillaries of *serous* as well as of *mucous* membranes, causing their contraction, and so diminishing congestion and lessening exudation. Opium, therefore, when given at the onset of the inflammation probably exerts a direct remedial local effect on the vessels of the inflamed membrane; it keeps the inflamed parts at rest by checking peristaltic action, and it quiets the nervous system and saves the strength of the patient by relieving pain.

In cases caused by perforation of one of the hollow viscera, by arresting peristaltic movement it prevents, to some extent, the further escape of the stomach or intestinal contents into the peritoneal cavity; and in cases where these foreign substances are shut off from the rest of the peritoneal cavity by local adhesions, by keeping parts at rest it prevents their breaking through.

The question as to the amount of opium that may be given must be determined by each individual case. Some patients are very sensitive to its effects, and are readily narcotised by even small doses—others require much larger doses to produce narcotic effects; and it must always be borne in mind that the presence of intense pain and acute inflammation seem to exhaust and dissipate, so to speak, a great deal of its narcotic effect, and, therefore, very much larger doses are needed in order to produce the full remedial effect of the drug. The criterion of the sufficiency of the dose is the relief of pain, and it is best to give one full dose at starting, and repeated moderate doses at short intervals until the pain is relieved. The equivalent of 2 grains of solid opium may be given at first, and 1 grain every hour until its full effect is produced. The effect of the opium should also be kept up for some time, so as to allow the inflammatory action completely to subside. The chief drawback to this mode of administering opium is in *obstruction* cases, in which hard, impacted fæces may possibly be the cause, and in such cases the sub-paralytic condition of the intestinal walls is aggravated, and it becomes excessively difficult to excite them afterwards to efficient contraction. But in such cases the peritonitis is usually localised and not general, and would have been preceded by a history of obstinate constipation or a chronic intestinal catarrh. We must be more sparing in our use of opium in these cases. So also in the cases dependent on causes which are only remedial by surgical operation, the prolonged and excessive use of opium may no doubt relieve the pain in such cases, but by masking the symptoms it produces a false sense of security, and precious time may be lost and the patient's chances of recovery greatly diminished.

It is in cases of puerperal peritonitis that the largest doses of opium have been given, and with the best results. Professor Alonzo Clark, who was an early advocate of the opium treatment of acute peritonitis, mentions several instances in which very large doses were given for a considerable period with no ill effects. A boy, 10 years of age, by gradual increase, at last took as much as $1\frac{1}{4}$ grain of sulphate of morphine every forty minutes. A woman took 32 grains of sulphate of morphine in twenty-four hours, and on the twelfth day the equivalent of 261 grains of opium! "Such doses," he says, "can only find their justification in the demonstrated fact that smaller doses will not produce the degree of narcotism desired." *

In giving opium it is important to give it in a form that can be readily absorbed. When there is great gastric irritability and vomiting there may be some difficulty in ensuring the retention of opium in the fluid form in the stomach, and it will then be advisable to give it in the form of *small* pills, and in order that these may dissolve readily they should be made in a special manner. Six grains of the extract of opium should be rubbed down with 6 minims of the tincture of opium, and enough powdered sugar added to make it into the consistency for making pills; the mass should then be divided into twelve pills, and one of these given every quarter of an hour until the desired effect is produced. Morphine may, of course, be given hypodermically, but it is apt to aggravate the nausea and sickness with some patients, and it often exerts a far more depressing effect on the heart than opium given by the stomach. Opium may also be given by the rectum—10 or 20 minims of the tincture, or a corresponding amount of the liquid extract, mixed with 1 or 2 ounces of thin gruel, may be thrown into the bowel frequently—but its effect in relieving pain is produced more slowly in this way.

A sort of reaction has recently set in in certain quarters against the routine administration of excessive quantities of opium in all cases of acute peritonitis, and the consequent paralytic condition of the intestinal walls, and the locking up of septic substances in the intestinal canal to which it gives rise. And it appears to us to be worthy of consideration whether the indiscriminate use of opium is always wise in all cases of the kind we are discussing. Meigs has argued, from his experience after surgical operations, that the exhibition of salines in large doses *at the very onset* of an attack of peritonitis is found to check the inflammatory process by withdrawing fluid from the intestinal and abdominal vessels through the watery stools they produce. And it is possible that such a method of treatment in such cases as he has in view may be more useful and more rational than that of locking up excrementitious matters in the bowels by opium. But the physician rarely sees cases in that very early stage, and the risks attending the excitation of the action of the bowels by purgatives at a subsequent period of the disease are too real to be lightly incurred. We think, however, that there are many cases in which the aseptic or antiseptic action of washing out the large intestine by copious enemata of warm water might well be combined with the early exhibition of opium, and might by diminishing meteorism and painful distension of the bowel, really minister to the comfort of the patient. We also would urge greater moderation in the use of opium, especially with a view to the possible early interference of the surgeon, whose chance of successful operation is often greatly diminished by the intestinal muscular and reflex paralysis induced by the too free exhibition of narcotics. Whitla says he is inclined to believe, "from the results of several *post-mortem* examinations, that many patients die from want of a purgative;"* yet he is by no means an advocate for their frequent use, and he thinks 6 or 8 grains of calomel the best drug for the purpose, and this should only be given after "the most serious consideration."

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* Pepper's "System of Practical Medicine," vol. ii. p. 1149.

Graves, and many of the past generation of physicians, combined calomel with opium in the treatment of acute peritonitis, and they may not, after all, have been wrong; for the calomel would act as an *intestinal antiseptic*, and the opium would prevent its having any immediate purgative effect, while after the severe symptoms had subsided, and the use of opium could be suspended, the eliminative action of the calomel would probably come into useful effect. Hitherto, in modern practice, we have, perhaps, thought too little of the possible evil that may arise from retaining toxic substances in the bowels in these acute febrile maladies.

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* "Dictionary of Treatment," p. 622.

Meigs recommends the cautious use of the following pill every four hours, unless it sets up severe pain :—

℞ Extracti belladonnæ	$\frac{1}{12}$	grain.
Extracti nucis vomicæ...	$\frac{1}{4}$	,,
Pulv. extracti aloes	$\frac{1}{6}$	,,
Pulv. rhei rad.	$\frac{3}{4}$	,,

M. f. pil.

To return to the question of *surgical interference* in cases of acute peritonitis. It is admitted on all hands that severe acute general peritonitis, especially in children, is almost invariably secondary to some visceral lesion, and is suppurative. In adults we believe there are a certain very few cases which originate in chill, and are of a rheumatic nature; we are also satisfied that some slight and partial cases occur in young children, either from chill or from irritating ingesta, or from both. But we should be disposed, from our own experience, to assert that these two latter forms can be distinguished by their relatively less severe symptoms, and by their responding quickly to warm local opiate applications, to repeated small doses of opium internally, and to enemata of warm water, with or without a saline or calomel aperient, as may be judged expedient.

But the far greater majority of cases belong to the former type, and we strongly urge that in these cases early surgical co-operation and consultation should be invited. Many of these cases are connected with suppurative appendicitis, and in such, and, indeed, in all suppurative and septic cases, flushing with a hot aseptic lotion and drainage of the abdominal cavity, for which often only a small exploratory incision is needed, seem to offer the *only chance* of cure.

Tubercular peritonitis is more frequently *chronic* or sub-acute than acute. It may, however, occur as a part of a general acute miliary tuberculosis, but that is not a condition with which we are now concerned.

The occurrence of tubercular peritonitis is usually associated with the presence of tubercle in other organs; as *e.g.* tubercle of the sexual organs, the uterus and Fallopian tubes in women,* the testes in men; or tuberculous ulcers of the intestine; or tubercular deposits in the lungs or pleura. In children it is often associated with intestinal tubercle and secondary tubercular affection of the mesenteric lymphatic glands, and it then presents that form of disease which is known as *Tabes mesenterica.*

It would seem, however, from recent reports of the successful treatment of tubercular peritonitis in children by laparotomy and other means, that tubercle of the peritoneum must be in some cases primary, and more prone to undergo curative changes than tubercle in other organs.

The early symptoms of tubercular peritonitis are often very obscure; sometimes it comes on abruptly as a severely acute peritonitis, and then its nature is very likely to be misunderstood; and sometimes the disease is quite latent, and it has been discovered accidentally in operations for hernia or ovarian tumours. Shifting abdominal pains, with emaciation, and perhaps diarrhœa, loss of appetite, a moderate evening rise of temperature,† tenderness on pressure over the abdomen, the surface of which may feel hot as well as hard and resistant, are the symptoms that may be looked for. There may be retraction or there may be swelling of the abdominal cavity; and in the latter case the effusion of fluid may give rise to fluctuation. When this disease occurs in children it is much easier of detection than in adults. The tumid, tender belly, resonant in parts and dull in parts, with occasionally a lumpy feeling, the pinched face and wasted limbs, and general discomfort and fretfulness, together form a fairly characteristic picture. Moreover, in many the omentum is found to be curiously indurated and rolled-up as it were into a roundish or elongated tumour, stretching across the abdomen above the umbilicus. We may, of course, have at the same time evidence of the deposit of tubercle in other organs.

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* Extension from the Fallopian tubes seems to be a frequent mode of origin, and hence perhaps the reason of the greater frequency of this disease in females.

† Sub-normal temperatures have not infrequently been recorded.

Ascites is common, but the exudation is often sacculated, and has often been mistaken for an ovarian cyst.

The successful **treatment** of these cases of tubercular peritonitis, surgical or otherwise, must, of course, depend greatly on whether the disease is limited to the peritoneal cavity,* or whether the peritoneal tubercle is only a part of a more widely spread tuberculosis. It is certain that these cases are now being regarded as by no means so necessarily fatal, at any rate in children, as they used to be thought.

Dr. Finlay has recorded the case of a boy of 17 who had *tubercular* peritonitis and ascites, together with double pleurisy, in which recovery occurred without any special treatment.

We have ourselves had recently a rapid recovery from tubercular peritonitis with much ascites, in a boy of 12; this was a chronic or sub-acute form, and the treatment consisted chiefly in painting iodine paint over the *abdomen* daily, or on alternate days, as it could be borne, and then smearing this with a layer of olive oil to prevent evaporation. At the same time he took half a grain of iodoform dissolved in a dessertspoonful of cod-liver oil, after food, three times a day. The improvement began early, and was steadily maintained. It is highly probable, as suggested by Osler, that spontaneous cure occurs in many cases in peritoneal tuberculosis just as it does in pulmonary tuberculosis, by the tubercle undergoing retrograde, fibroid, and sclerotic changes.

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* Prof. W. Osler ("Tubercular Peritonitis," Johns Hopkins Hospital Reports) says: "In many cases the process is entirely local. In five of seventeen cases of which I have *post-mortem* notes the condition was confined to the peritoneum."

Fagge * remarks "that in children tubercular peritonitis is capable, in the majority of cases, of being cured by the local application of *linimentum hydrargyri.*" The liniment is spread freely over the surface of a flannel belt, which is stitched round the abdomen. He has seen the greater part of the ascitic fluid removed within a few days under such treatment, together with improvement in health and strength. Cod-liver oil and syrup of the iodide of iron may be given at the same time. In chronic cases, either with much ascitic effusion, or associated with *mesenteric gland disease,* Whitla † speaks very highly of the results obtained by inunction of cod-liver oil into the skin over the surface of the abdomen. He admits that "the odour becomes very objectionable" to the little patient's friends, and we should prefer to try first the effect of iodine paint smeared over with olive oil as we have already suggested, and to administer the cod-liver oil internally with a small dose of iodoform.

In cases with much ascitic fluid in children repeated aspiration or tapping has been attended with successful results. ‡

But a very important question in connection with the treatment of tubercular peritonitis is what are the cases in which we should recommend the operation of *laparotomy?*

In the first place, cases of somewhat sudden onset and rapid effusion, probably due to a fresh eruption of tubercle, without a very high temperature, offer the best chances of success; for the disease is then probably primary, the condition of general health is better, and there is less danger of general infection.

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* "Principles and Practice of Medicine," vol. ii. p. 320.

† "Dictionary of Treatment," p. 520.

‡ A case of this kind is reported in the *British Medical Journal* of October 3, 1891, by Dr. J. C. J. Fenwick.

Secondly, when the exudation is purulent, and especially if sacculated, and there are large caseous deposits in the peritoneal cavity, as a palliative procedure laparotomy may be advised.

The operation is not indicated in the very chronic adhesive cases; here sclerotic healing changes may be in progress, and should not be interfered with.

Of the **diagnosis** in these cases Greig Smith* says it is "essentially that of encysted ascites," and of the operation, that it is one "usually performed on an uncertain diagnosis, or for exploratory purposes. The first steps, after the opening of the peritoneum, should be taken with extreme caution. The adherent bowels, or omentum, which enclose the ascitic fluid in front, are carefully separated, and the cavity exposed. The fluid is removed either by the use of a siphon-tube or by sponging. It is apparently not necessary or even expedient to use a strong antiseptic for the cavity. Irrigation with simple hot water has been found to be quite efficient. The drainage-tube is inserted, the wound is closed around it, and the dressing and after-treatment managed in the ordinary manner."

Parker Syms, of New York, objects to drainage as likely to result in a permanent sinus, and he thinks disinfectants useless; he does not consider the presence of signs of pulmonary tuberculosis (if not advanced) as counter-indicating operation, as he considers the improvement likely to be gained will enable the patient to make a better fight with his phthisis; he also insists that in unsuccessful cases the operation does no harm.

A French authority thus sums up the general conclusions which may be deduced from the results of operation in these cases: "Laparotomy usually gives excellent results in the encysted form of the disease; good results in the diffuse form; fair results in the purulent form, and negative results in the dry ulcerated form."*

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* "Abdominal Surgery," 4th edition, p. 789.

It is extremely difficult to explain in what way opening the peritoneal cavity exercises so favourable an influence over tubercular peritonitis; but it would seem to exercise the same beneficial effect in other forms of peritonitic effusion, even those associated with *malignant* disease. Spencer Wells, Lawson Tait, and others have commented on the remarkable improvement often observed to occur after laparotomy in cases of malignant disease in the abdominal cavity.

The extremely favourable results from operation that have hitherto been published, perhaps scarcely present fully every side of the question, and it may be too early at present to draw very positive inferences from these, as König† has done. Of the 131 cases of tubercular peritonitis collected by him 65 per cent. were cured. We may, however, conclude with certainty that the introduction of laparotomy as a method of treatment in many forms of peritoneal tubercle is a real advance in the therapeutics of this disease formerly so fatal.

ADDITIONAL FORMULÆ.

For diarrhœa in peritonitis.

℞ Acidi tannici, 15 grains.
Opii puri, 1½ to 3 grains.
Pulv. acaciæ, 60 grains.

M. et divide in pulv. 10. A powder every two hours.
(*Prof. Braun.*)

Opium powders for peritonitis.

℞ Pulv. opii, 9 grains.
Sacchari albi pulv., 1½ dr.

M. et divide in pulv. 12. A powder every two hours.
(*Bamberger.*)

For severe vomiting in peritonitis.

℞ Morphinæ hydrochlor., 1½ gr.
Aquæ laurocerasi, 1½ dram.
Mist. amygdalæ, 6 oz.

M. f. mist. A tablespoonful every hour.
(*Braun.*)

Opium and belladonna pills for peritonitis.

℞ Pulv. opii, 1 grain.
Extr. bellad. alcohol., $\frac{1}{24}$ gr.
Bismuthi oxydi, 1 grain.

M. f. pil. To be taken four times a day.
(*Whitla.*)

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* *Journal de Médecine*, February 10, 1891.
† Berlin Medical Congress, 1889.

Aconite and opium in peritonitis.

℞ Tinct. aconiti, 2 drams.
Tinct. opii ad 1 oz.

M. f. tinct. Ten to fifteen drops every hour or two.
(*Bartholow.*)

Morphine powders for peritonitis.

℞ Morphinæ hydrochlor., 2 grs.
Sacchari albi, 30 grains.

M. et divide in pulv. 6. A powder every hour or two.
(*Braun.*)

Part II.

TREATMENT OF DISEASES OF THE HEART AN BLOOD-VESSELS; AND OF THE BLOOD AND DUCTLESS GLANDS.

CHAPTER I.

TREATMENT OF ACUTE AFFECTIONS OF THE HEART AND PERICARDIUM.

Acute Pericarditis. — Etiology — Acute Rheumatism — Bright's Disease—Gout—Scurvy—Diabetes—Puerperal Septicæmia—Scarlet Fever — Tuberculosis — Forms of Pericarditis— Often latent — Symptoms. *Indications for Treatment* — Sodium Salicylate—Alkalies and Aconite—Opium—Aperients—Ice-bag —Leeches — Bleeding — Warm Fomentations — Chloral and Henbane—Quinine in Effervescence — Blisters — Iodine — Potassium Iodide and Digitalis — Mercurial Inunctions — Tonics—Food and Stimulants—Puncture and Aspiration—Incision in Purulent Effusions.

Acute Endocarditis. —Its Nature — Etiology — Micro-organisms. *Indications for Treatment*—Usually those of Acute Rheumatism — Alkalies — Salicin and Quinine — Value of Water — Formulæ — Opium — Ice-bag — Blisters—Alcohol—Digitalis—Perchloride of Iron—Belladonna Plaster—Rest—Potassium Iodide.

Malignant and Ulcerative Endocarditis.—Its Relation to Septic Processes and to Microbic Action—Septic Emboli—Ends generally fatally—Treatment *Antiseptic*. Additional Formulæ.

In considering the subject of the **treatment of diseases of the heart**, we shall be chiefly concerned with those *chronic* affections of that organ which involve some lesion of one or other of its sets of valves, or of its muscular structure, or of both; but we shall also have to discuss the treatment of *acute* affections of the heart, and of its covering, the *pericardium*. This, however, will be done briefly, because these *acute* inflammations generally arise as complications of other diseases, the full examination of the treatment of which will be found under their appropriate headings.

ACUTE PERICARDITIS.

Pericarditis rarely occurs as a primary idiopathic disease; some authorities, however, believe it does so in childhood ; it is almost invariably secondary to some *general* malady, or it occurs as an extension of inflammation from some adjacent part.

Acute rheumatism is by far the most common cause of pericarditis, especially in children and young adults, and the pericarditis has been observed, more particularly in the former, occasionally to precede the joint affection. *Bright's disease* is another common cause of pericarditis. Gout, scurvy, and diabetes have also been regarded as causes of this disease. Pericarditis is also apt to occur as a consequence of certain *septic* processes, as *e.g.* in puerperal fever. It sometimes appears as a complication of the eruptive fevers, particularly of scarlet-fever, in childhood. A *tuberculous* form occurs in connection with tuberculosis of the serous membranes. It may arise by extension from left pleuro-pneumonia, and it may occur in consequence of disease of the adjacent chest-wall, or mediastinal structures, or neighbouring abdominal viscera, and it may be caused by pyæmic abscess of the myocardium.

In many of these connections it is simply one of the manifestations occurring in the progress of an inevitably fatal malady.

Three forms of pericarditis have been described :—

1. A *dry* form, in which there is simply a fibrinous exudation on the surface of the serous membrane.
2. Pericarditis, *with effusion,* either sero-fibrinous, hæmorrhagic, or purulent.
3. An adhesive form, in which the *pericardium* becomes adherent to the surface of the heart.

The physical signs of acute pericarditis should be carefully looked for in the course of all those affections which are prone to give rise to this disease. This is the more important, as it is apt to be **latent,** especially when it occurs in connection with Bright's disease, and *general symptoms* may be entirely absent. More commonly, however, complaint of *pain* in the præcordial region is the first indication of the occurrence of pericarditis. The *pain* is often intense, and radiates over the chest and down the left arm, and there is great tenderness on pressure over the cardiac and epigastric regions. Great and distressing *dyspnœa* is also another prominent feature in acute pericarditis, especially when there is a large amount of effusion. Sometimes there is great disturbance of the cardiac action, with palpitation and a rapid and irregular pulse.

The **indications for treatment** are, first, to moderate and reduce the inflammation as quickly as possible; secondly, to regulate the cardiac action and lessen its rapidity; thirdly, to relieve pain and distress; fourthly, to promote the absorption of the effusion; and fifthly, to remove it by operation when its presence and amount give rise to dangerous symptoms from pressure on the heart. Absolute rest in bed is, of course, essential.

In rheumatic cases, *sodium salicylate* or *salicin* in combination with *potassium bicarbonate* may be given so long as the arthritic symptoms remain unrelieved. Some American writers on therapeutics object to the use of salicylates in cases of rheumatic *pericarditis*, but urge the use of alkalies, together with full doses of aconite to lower the cardiac action. We cannot share this view, for if the salicylates (or salicin) are indicated in the treatment of ordinary attacks of polyarthritic rheumatism, the additional affection of a visceral *joint*, as, in a certain sense, the pericardium may be termed, can hardly contra-indicate its use. Moreover, if a depressing drug like aconite is indicated in these cases for the sake of reducing the cardiac action, why not sodium salicylate, the remedial effect of which in acute rheumatism is usually accompanied by a rapid lowering of the pulse frequency? We often find, on the third day of treatment with

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sodium salicylate in acute rheumatism, the pulse beat reduced to 60 in the minute.*

Opium combined with saline diaphoretics is very useful in those cases in which there is much præcordial *pain.* We prefer to give it in the form of Dover's powder, 5 grains with a dram or two of liquor ammonii acetatis, every three or four hours, until the pain is subdued. To ensure a free action of the bowels, especially during this opium treatment, an efficient saline aperient should be given daily. Two or three drams of sodium sulphate in an ounce and half of infusion of senna usually answers well.

The application of an **ice-bag** to the præcordial region is a valuable remedy for allaying the inflammation and quieting cardiac action. It is not so popular in England or in America as it should be, for when applied *early* and thoroughly it has proved in many cases very efficacious. When the use of the ice-bag is objected to, the pain and distress may generally be greatly relieved by the application of a few leeches over the sternum, followed by a hot linseed poultice sprinkled with laudanum. General bleeding is rarely called for, although Fagge observes: "When there are symptoms of embarrassed circulation with orthopnœa and distress, an irregular pulse, arterial anæmia and venous congestion, the abstraction of 4 or 5 ounces of blood from the arm is found in some cases to give remarkable relief, and probably is never injurious."

Warm applications, as hot flannels, hot cotton wool, and hot poultices to the præcordial surface are usually comforting. When there is any reason against the use of opium, chloral or henbane may be employed to allay pain and restlessness. In rheumatic cases when the depressing effect of the salicylates is to be feared, or when the joint inflammation is subdued, quinine in moderate doses, 1 to 3 grains, may be given in effervescence in combination with potassium citrate.

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* We shall have to discuss the use of the salicylates in acute rheumatism in a subsequent chapter.

When we have a large effusion to deal with, the absorption of which we are anxious to promote, blistering will frequently be found most useful. In rheumatic cases large effusions will constantly be found to disappear rapidly after a full-sized **blister** followed by hot poultices. In renal cases cantharidine applications are, however, to be avoided, but we may then resort to the use of strong iodine paint. Potassium iodide alone, or combined with digitalis, and other diuretics will be found, in the later stages, a valuable agent for promoting the disappearance of the effusion. Mercurial inunctions are still advocated for the removal of slowly disappearing effusions.

If cardiac failure should threaten, supporting remedies must be freely applied, as bark, quinine, and strychnine, with ether, ammonia, alcohol, etc. Light food, but not with too much fluid, for fear of increasing the effusion, should be given. Light puddings, whipped eggs, milk, or bread and milk, oatmeal gruel, and the lighter kinds of fish are suitable.

When a large effusion is seriously compressing the heart and embarrassing its action and causing grave dyspnœa, and especially if it has resisted the application of blisters—or if there is reason (from exploratory puncture with a hypodermic syringe) to believe the effusion to be purulent, removal of the fluid by **aspiration** or **incision** of the pericardium has to be considered.

After carefully percussing and outlining the area of dulness, the nature of the fluid effusion should first be ascertained by puncture with the needle of a hypodermic syringe, carefully rendered aseptic. The best situation for this and subsequent puncture or incision is the fourth or fifth left intercostal space, about an inch external to the left margin of the sternum,* so as to avoid the internal mammary artery.

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* "In large effusions the pericardium can also be readily reached without danger, by thrusting the needle upward and backward close to the costal margin in the left costo-xiphoid angle" (*Osler*).

If the fluid is serous or sero-fibrinous, then a fine aspirating needle or trocar should be introduced in the same spot, and the fluid, or a portion of it, very slowly withdrawn. If the fluid is found to be *purulent*, then an incision must be made into the pericardium in the situation already mentioned. The incision should be small at first, and cautiously enlarged. It may be enlarged by cutting or dilating with sinus forceps. The pus having been allowed to escape, a soft drainage-tube must be inserted, and the cavity may be washed out, if necessary, from time to time with a warm boric acid solution. This will often be necessary in order to detach and remove fibrino-purulent caseous masses. But this irrigation must be performed with great care and caution, and we should particularly see that there is always a *free outlet* maintained for the escape of the irrigation fluid, as suddenly fatal mishaps have occurred from the pressure of irrigation fluid on the heart, owing to the accidental plugging of the outlet tube.

ACUTE ENDOCARDITIS.

"**Simple**" or "**benign**" endocarditis, the form which is commonly met with, is not now regarded as presenting any essential difference in nature from those rarer forms which, from their almost inevitably fatal character, are spoken of as "*malignant*" or "*ulcerative*" endocarditis. Osler says:—"There is no essential anatomical difference, as all gradations can be traced, and they represent but different degrees of intensity of the same process."

We must consider briefly the pathological nature of this disease, so far as it is at present understood, before we can establish rational indications for its treatment. In simple endocarditis **minute vegetations** appear on the endocardium covering the valves or lining the cavities of the heart. These vegetations are often attached by very slender pedicles, so that they have a cauliflower-like form. They have an irregular, cracked surface, giving them a warty aspect.

The appearance of these vegetations is accompanied by a proliferation of the sub-endothelial connective tissue elements. A deposit of fibrin from the blood occurs on the surface of these projections, so that a *vegetation* has been described as practically "a small area of granulation tissue capped with fibrin." *Micro-organisms* are often found entangled in the deposited fibrin.

In the majority of cases the granulation tissue undergoes cicatrisation, and leaves only a slight nodular thickening of the valve. It is rare in acute febrile endocarditis for a vegetation to be detached and carried as an **embolus** to a distant part of the circulation, but this accident is not uncommon in that form of endocarditis which attacks old sclerotic valves.

The dangerous part of an attack of simple acute endocarditis is the tendency to slow sclerosing changes in the valve tissues, and the ultimate contraction and deformity to which it leads. It is remarkable that it is almost invariably the *left* side of the heart that is affected, except in fœtal life, when the right side of the heart is found affected also, and it has been suggested that the inflammatory poison must need arterial blood for its activity. The mitral valve is more frequently affected than the aortic.

With regard to the **etiology** of simple acute endocarditis it must be borne in mind that it does not occur as a disease of itself, but is always a complication of some other affection, and in the vast majority of cases that affection is acute rheumatism. It has been suggested that it may be caused *not* by anything in the disease itself, but simply by an altered state of the fluids, "a reduction, perhaps, of the lethal influences which they normally exert, permitting the invasion of the blood by certain micro-organisms" (*Osler*). It also occurs in connection with tonsillitis, scarlet-fever, acute pneumonia, phthisis, chorea, cancer, gout, diabetes, and Bright's disease. It is also prone to occur in a recurrent form, attacking those valves already disabled and crippled by former attacks.

The **indications** for **treatment** are necessarily, in the first place, those which apply to the disease of which it is a complication; and as this is generally acute rheumatism, it is scarcely possible to consider the treatment of simple acute endocarditis apart from that of acute rheumatism. The first indication for treatment is, therefore, to modify, if possible, the disordered state of the blood which has excited the inflammation. The second indication is more directly applicable to the state of the heart itself—it is to moderate and reduce its more or less excited action, for mechanical activity of the valves tends to increase and aggravate the inflammatory changes.

In the case of rheumatic endocarditis the free use of alkalies so as to maintain and increase the alkalinity of the blood has many advocates. "When they are given promptly," says one writer,* "and with the one object speedily to alkalinise the urine and to keep it alkaline, the heart may be reasonably regarded as safe from serious attack"; and the same author maintains that "heart inflammations have increased in frequency since the introduction of the salicylates in the treatment of rheumatism."

We are not aware of any substantial facts that can be advanced in support of this statement; we believe the best treatment for these cases is a combination of alkalies and salicin, with which we would also combine some moderate doses of quinine. Another means of modifying the blood condition and its irritating effects on the endocardium, is the free administration of diluent fluids, and especially of *pure water*. Instead of giving the patient strong meat essences and broths to drink, which, for aught we know, may have a very injurious influence on the blood condition, we prescribe as much pure warm water as we can get absorbed, slightly flavoured with lemon juice, and we give no food in the early stages (when there are no signs of exhaustion) but milk freely diluted with an alkaline water, a little warm weak broth, and thin gruel. All through the early acute stage the food should be very light. The indication, we venture to urge, is to wash the contaminated blood by passing large quantities of pure water rapidly through the circulating fluid. The alkaline medicines should be given *largely diluted with water.* The stomach cannot absorb large quantities of food and water at the same time, and we consider the latter of the greater importance at the outset of this disease. We would suggest the following formula as a most useful combination in cases of rheumatic endocarditis either threatening or established :—

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* Dr. W. H. Thomson in Hare's "System of Practical Therapeutics."

℞ Salicini	60 grains.
Potassii bicarb.	4 drams.
Sodii bicarb.	2 ,,
Aquæ	ad 12 oz.

M. f. mist. Two tablespoonfuls every two hours, with two tablespoonfuls of the following mixture :—

℞ Quininæ sulph.	24 grains.
Acidi citrici...	3 drams.
Tinct. limonis	1 dram.
Aquæ	ad 12 oz.

M. f. mist.

In this way the patient will get 60 grains of salicin and 24 grains of quinine in 24 hours dissolved in 24 oz. of alkaline solution.

Objection has been made to the use of *sodium salicylate* in these cases on account of its depressing effect, and the preceding formula is not open to that reproach.

When rheumatic endocarditis is accompanied by pain and distress in the præcordial region, a full dose of Dover's powder (12 to 15 grains) should be given at night, and a hot linseed poultice sprinkled with laudanum applied to the præcordia. This will not only relieve cardiac pain but it will also quiet cardiac excitement. The application of the ice-bag is preferred by some physicians, and we think it valuable, especially in children. The application of blisters to the præcordia has been advocated, and they may be of use in protracted cases.

In the severer forms with very rapid action of the heart and much exhaustion, the free administration of alcoholic stimulants is indicated; small doses of digitalis and opium are found useful, especially in children; the tincture of the perchloride of iron in full doses has been found valuable in some cases.

During convalescence a large belladonna plaster over the heart will be useful for quieting cardiac action; *absolute repose* must also be long insisted upon after an attack of endocarditis, with the same object. The long-continued use of potassium iodide in small doses, together with a vegetable tonic, after the attack, has appeared to us to be sometimes instrumental in removing the physical signs of valvular changes, and we believe it diminishes the tendency to progressive sclerotic changes both in the valves and in the vascular walls.

MALIGNANT OR ULCERATIVE ENDOCARDITIS.

This is believed to occur occasionally as a *primary* affection of the endocardium; it is much less frequently a complication of acute rheumatism than the *simple* form; but the endocarditis which occasionally occurs as a complication of acute pneumonia is apt to be of this malignant type. It is prone to occur in connection with all kinds of **septic** processes and all forms of septicæmia. It is characterised, as its name implies, by ulcerative and suppurative processes affecting chiefly the valvular endocardium. The necrotic process leads to superficial or deep ulceration which may even perforate a valve or a septum; and small abscesses may be found at the base of the vegetations. Various *micro-organisms* have been found associated with these ulcerative changes: streptococci, staphylococci, and in pneumonic cases pneumococci, have been seen. The transfer of septic emboli from the heart to various parts of the body where they set up septic suppurative processes is one of the most serious consequences of this disease.

Sometimes an ulcerative process attacks the endocardium in cases of *chronic valvular* disease, and symptoms due to diffused emboli often attend the closing scenes of chronic heart disease.

Most cases of ulcerative endocarditis terminate fatally and run a somewhat rapid course; the only exceptions to this rule are in some of the cases that occur in connection with old sclerotic valve disease.

There are, as might be anticipated, few direct indications in this disease for efficient treatment. "In the severer cases the treatment is practically that of septicæmia" (*Osler*). Quinine in full doses, mercuric chloride, sodium sulpho-carbolate, salol; as large doses of these and other antiseptics as can conveniently be given have been advocated, and appear to answer the only rational indication afforded. Hereafter it may be found possible to inject some non-irritant antiseptic agent into the veins so as to reach the heart in a sufficiently active form to arrest the septic processes at work there.

Acute myocarditis, which sometimes accompanies acute pericarditis and acute endocarditis, presents no special therapeutic indications.

ADDITIONAL FORMULÆ.

Cooling acid mixture in pericarditis.

℞ Acid. phosphorici, dil., 30 minims.
Syrupi mori, 5 drams.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful every hour. (*Bamberger.*)

As a cardiac tonic and febrifuge in pericarditis.

℞ Quininæ sulphatis, 6 to 18 grs.
Sacchari albi, 80 grains.

M. et divide in pulv. 6. One every three hours. (*Bamberger.*)

In ulcerative endocarditis.

℞ Quininæ sulph., 12 to 36 grs.
Acidi citrici, 24 to 72 grains.
Syrupi limonis, 1 oz.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful every three or four hours.

Mixture in convalescence from endocarditis.

℞ Potassii iodidi, 32 grains.
Potassii bicarb., 80 grains.
Sp. ammon. arom., 4 drams.
Tinct. cinchonæ comp., 1 oz.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful three times a day.

CHAPTER II.

THE TREATMENT OF CHRONIC AFFECTIONS OF THE CARDIAC VALVES.

Chronic Valvular Lesions—General Therapeutic Indications—Etiology—Mechanical Effects and Consequences—Hypertrophy and Dilatation—Treatment of *Compensated* Cases—Regimen—Exercise—Clothing—Avoidance of Excitement—Food and Stimulants — Alcohol — Tea — Coffee — Tobacco — Thermal Treatment—Aperients—Climate—Drugs rarely needed—Digitalis—Iron—Arsenic—Potassium Bromide—Open-air Life—Treatment of *Non-compensated* Cases—Effects of *Mitral* Failure—Pulmonary Engorgement—Dyspnœa—Cough—Expectoration—Hæmoptysis—General Venous Engorgement—Enlargement of Liver—Gastro-Intestinal Catarrh—Constipation—Scanty Albuminous Urine—Cyanosis—Dropsy—Effects of Failure of *Aortic* Valves—Pallor—Cerebral Anæmia—Palpitation—*Pain*—Orthopnœa—Frequency of Embolism—*Chief Therapeutic Indication*—To raise the Cardiac Tone—Importance of absolute Rest—*Cardiac Tonics*—Digitalis—Strophanthus—Caffeine—Convallaria—Sparteine—Adonis vernalis—Coronilla varia—Cactus grandiflorus—Barium Chloride—Strychnine—Quinine—Kola—Coca—Iron—Aperients. Additional Formulæ.

We now pass on to consider the management of those chronic disorders of the cardiac mechanism dependent on *disease* of its *valves*, and of the several morbid states which arise therefrom.

In considering the management of valvular diseases we shall have to draw a marked distinction between *compensated* and *non-compensated* cases.

Apart from the treatment of certain complications and special symptoms, the therapeutic problem presented to us in dealing with these cases may be summarised in the three following indications:—

1. To arrest or retard degenerative processes.
2. To diminish the mechanical work of the heart.
3. To raise the tone of the cardiac muscle.

We shall show, as we proceed, what means we have at our disposal for fulfilling these indications.

With regard to **chronic valvular lesions,** we have already seen that these usually originate in an attack of acute endocarditis, and especially in rheumatic endocarditis; the thickening and deformity of the valve may be but slight at the end of the acute attack, but the valve so injured is liable to undergo further deformity by becoming the seat of chronic endocarditis which may ultimately lead to serious impairment of its functions.

But chronic endocarditis leading to sclerotic changes in the valves may arise from other causes than rheumatism, as from syphilis, gout, or alcoholism. Another cause of chronic valvular disease, especially of the aortic valves, is *strain* from excessive muscular exertion. In athletic exercises or in severe and sustained muscular labour, there is an increased strain imposed on the aortic valves during the ventricular diastole, and this in time sets up chronic endo-arteritis and sclerotic changes in the valve segments. In some cases the chronic affection of the aortic valve is associated with *atheromatous* changes in the adjacent part of the aorta.

The effect on the mechanism of the heart of these valvular changes is either to narrow and constrict the opening guarded by the valve (*stenosis*) and so diminish the outflow through it, or to render the valve incompetent to close the opening as it should do (*insufficiency*), and so to allow of an abnormal backward flow of blood into the chamber from which it had been propelled. In either case dilatation of one of the chambers of the heart must occur from increase of blood pressure within it. When, as is often the case, constriction of the opening is combined with incompetence of the valve, not only is there an abnormal mechanical difficulty interposed in the propulsion of the blood from one chamber to the other, but there is an additional mechanical distending or dilating influence from the over-filling of one of the chambers by an abnormal reflux of blood, so that the chamber receives a backward as well as a forward current. These changes take place, as a rule, gradually, and not abruptly, therefore the insufficiency and consequent dilatation are, at first, only moderate, and the natural reserve force of the cardiac muscle is equal to overcoming the difficulty. But when the insufficiency is considerable, obviously the cardiac chamber chiefly affected must need greatly increased muscular force to propel so largely increased a volume of blood, and this is provided by an increase or *hypertrophy* of its muscular walls, and so long as this hypertrophy is adequate to overcome the mechanical difficulty proceeding from the diseased valve, the valvular lesion is said to be *compensated*, and the circulatory equilibrium is maintained. But when the hypertrophied muscle begins to degenerate, and to be inadequate to overcome the effect of the valvular lesion, *compensation* is said to *fail*, and symptoms dependent on disturbance of the circulatory equilibrium begin to make their appearance. We see, from the foregoing, that cardiac dilatation and hypertrophy are common and necessary consequences of chronic valvular disease, and that the latter cannot be regarded as in itself a disease, since it usually arises as a natural conservative process.

But **hypertrophy** and **dilatation** of the heart also arise without the existence of valvular disease. Whatever increases the work of the heart may cause its hypertrophy: as, for instance, adherent pericardium, which interferes with and impedes the regular cardiac contractions; and continuous excessive action of the heart, "palpitations," due either to nervous disturbance, such, for instance, as is associated with exophthalmic goitre, or to the action of stimulants, such as tea, coffee, tobacco, and alcohol. Or the increased work may depend on peripheral obstruction as in general arterio-sclerosis, or on contraction of the smaller arteries from the presence of toxic matters in the blood raising the intravascular tension; or it may be due to prolonged and excessive muscular exertion, which by compressing the small vessels acts in the same way and greatly increases arterial blood-pressure. In all these conditions the work of the ventricle is increased, and it therefore hypertrophies. Hypertrophy of the *right* ventricle similarly occurs (apart from valvular disease) when any obstruction or increased resistance is encountered in the pulmonary circulation, as in pulmonary emphysema, pulmonary cirrhosis, etc. *No treatment* can be, or indeed should be, directed against this form of hypertrophy, apart from the morbid state that has excited it, as it is mainly compensatory and beneficial.

Dilatation often accompanies hypertrophy, and is dependent on the same causes, *i.e.* on whatever increases the intraventricular pressure—which may be either an increased volume of blood to be propelled or an increased resistance to be overcome. This requires no more treatment than does the co-existing hypertrophy. But it is not so with all cases of cardiac dilatation and strain, and we shall reserve what we have further to say on the etiology and treatment of dilatation of the heart until we have considered the treatment of chronic valvular affections.

We will first consider the **treatment** of those cases in which **compensation** is perfect and complete.

Such cases require careful and discriminating management. It may not be necessary to administer drugs, it may even be injurious to do so, but in order to maintain adequate compensation, and to prevent or postpone any disturbance of the same, the most judicious reginimal and hygienic treatment is constantly needed.

There exists some difference of opinion amongst physicians whether patients who are found to be the subjects of a compensated valvular lesion should or should not be informed of the fact. We think that in by far the great majority of cases no harm, but often great good, results from explaining frankly to the patient the true state of the case. The public are rapidly learning that "heart disease" does not necessarily mean premature and sudden death; and if anything could promote such a termination it is to leave them in ignorance of the importance of that judicious care and caution in their manner of living, upon which a continuance of sound health depends. A few highly nervous persons may, perhaps, be better left in ignorance of the fact; but when we reflect how common such affections are, and that discussions with regard to their effects on longevity are constantly occurring, without any kind of reserve, in connection with proposals for life assurance, etc., we are inclined to conclude that the mystification occasionally resorted to is unwise and attended with no good result. It often produces more real alarm than a frank explanation of the actual state of matters. We rarely attempt to conceal from a patient that he has phthisis, or cancer, or Bright's disease, why then should we take pains to conceal from him the fact that he has a far less serious malady?

The **mode of life** prescribed for such a patient should, in the first place, be free from all strain or over-exertion, physical or mental. He should be particularly cautioned against indulging in athletic sports, or undertaking violent or protracted muscular effort of any kind. Gentle, moderate exercise is useful and necessary, but all running, climbing, rowing, or hurrying of any sort, should be condemned. Sudden rupture or failure of compensation can often be traced to some indiscretion of this kind. Occupations entailing great muscular effort or fatigue, or attended by exposure to injurious atmospheric conditions, should be avoided. The clothing should be warm and should fit easily and comfortably.

All emotional excitement, worry, and anxiety, should be as far as possible avoided. Sexual relations are, in some forms of cardiac disease, especially injurious. In the male the existence of aortic incompetence makes sexual intercourse particularly risky, and in the female the presence of mitral stenosis renders utero-gestation especially dangerous.*

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* We have known several instances of premature death in young women with mitral stenosis, who have become pregnant and have died during pregnancy, or soon after delivery.

The food should be plain, nourishing, and digestible, and not excessive in quantity; over-filling of the vascular system or over-distending the stomach with excess of food and drink is to be greatly deprecated. The habitual use of alcohol should be forbidden, and tea and coffee should be taken only in very moderate amounts, and when they are noticed to cause cardiac excitement they should be avoided. Tobacco is always injurious in these cases. The occurrence of cardiac intermissions in such patients may often be traced to the use of tea, coffee, or tobacco, and they will disappear on leaving them off.

The subjects of cardiac valvular disease should avoid sea-bathing or Turkish baths, or baths too cold or too hot; but daily tepid sponging followed by friction of the skin is advantageous.

Although, recently, courses of sulphur baths at Aix, of salt baths at Nauheim, and of hot baths at Bath, have been advocated in cases of valvular disease of rheumatic origin, we doubt greatly the general applicability of courses of mineral waters in these cases; we should not, however, prohibit a modified application of the methods of treatment in vogue in those places for the relief of any articular complications which might appear to call for thermal treatment.

Constipation should be guarded against by the occasional use of gentle aperients, such as a mild aloetic pill at night and a dram or two of sodium sulphate the following morning.

A moderately warm, dry and equable **climate** is that best suited to cardiac patients, where a fair amount of sunshine can be met with in winter, and where protection from damp and cold winds can be obtained.

It is not necessary to prescribe drugs in these compensated cases, so far as the valvular lesion is concerned. Neither digitalis nor iron is needed, and may prove injurious; but the co-existence of anæmia may call for the use of the latter. Arsenic is sometimes more beneficial in the anæmia of these cardiac cases. Sodium bromide is occasionally needed to allay the nervous disturbances not infrequently encountered in those compensated mitral cases in women.

When, however, failure of compensation seems to threaten and the cardiac action tends towards irregularity and increased frequency, the long continued use of some mild iron tonic is often of the greatest service. It may be combined with small doses of potassium bromide. Prof. W. H. Thomson says, "In primary chronic valvular disease open-air life and iron taken from time to time as a prophylactic will serve indefinitely to ward off the day of heart failure."*

It will be needful to review briefly the various morbid conditions which follow the failure of compensation in chronic valvular disease, and we will first consider the case of a **non-compensated** lesion of the **mitral valve.**

Whether the lesion be insufficiency and regurgitation, or stenosis and obstruction, the effect on the circulation will be much the same when compensation fails, but it is rare to find a serious obstructive lesion of the mitral without some co-existent insufficiency. In pure mitral stenosis it is through failure of the right ventricle especially that compensation is broken.

Tracing the effects of failure of compensation backwards step by step, we find that the over-full and dilated left auricle, unable to empty itself completely as usual into the left ventricle, an impediment to the outflow from the pulmonary veins arises, and as the right ventricle is no longer able to fully overcome this, dilatation of the pulmonary vessels and engorgement of the lungs follow. This congestion of the pulmonary vessels and retardation of the blood current in them, gives rise to imperfect aëration of the blood, and to respiratory dyspnœa, together with a tendency to hæmoptysis, as the over-distended vessels are apt to give way; and there is also a disposition to congestive bronchial catarrh, with cough and watery or sanguineous expectoration. Thus we see that the first symptoms that are liable to arise as the result of failing compensation are those due to passive pulmonary engorgement: dyspnœa, cough, expectoration, and sometimes hæmoptysis. At the same time the action of the heart becomes feeble, labouring, and irregular, and palpitation is complained of. The strain also makes itself felt on the right cavities of the heart, and the right ventricle yields to its excessive labour, the right auricle becomes overdistended, and the outflow of blood from the venæ cavæ and the systemic veins is hindered.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 728.

The liver and the other abdominal viscera feel this obstruction in the venous current, their vessels become over-filled, and the liver often becomes greatly enlarged. Hindrance to the portal circulation in the liver leads to congestive catarrh of the stomach and intestines, and pressure on the bile ducts by the distended vessels within the liver gives rise to a subicteric staining of the skin, to a diminished discharge of bile into the intestines, and thus to constipation.

Distension of the renal veins and retarded circulation in the renal vessels causes scanty, high-coloured urine, which may contain albumen, casts, and blood-cells.

Evidence of obstruction to the circulation is seen in the superficial veins; they become distended and stand out prominently from the surface, the venules dilate, and the skin becomes cyanotic; general dropsy then usually sets in, beginning in the feet and ankles and extending upwards, usually affecting also the abdominal cavity, which is especially prone to ascites from the co-existence of obstruction to the portal circulation. Dropsy of the upper extremities and of the other serous cavities may supervene.

These are the chief morbid conditions which follow failure of compensation in mitral disease.

We see, then, that our therapeutic measures must be directed not only to raising the tone of the cardiac muscle, but also to the relief of the visceral congestions and to the removal of dropsical exudations; but it is clear that we cannot carry out the two latter indications unless we also succeed in fulfilling the former.

In cases of **aortic valve** disease, unless the mitral valve be also involved, as is not infrequently the case, failure of compensation is attended with somewhat different phenomena. Aortic insufficiency, although a more serious affection than the like lesion in the mitral, may through hypertrophy of the left ventricle remain for many years perfectly compensated, and may give rise to no morbid symptom. But when from degenerative changes in the hypertrophied muscle, and a coincident sclerotic condition of the aortic arch and the orifices of the coronary arteries, compensation begins to fail, the following symptoms usually present themselves.

Owing to the sudden emptying of the vessels of the head and face due to aortic regurgitation, great pallor and thinness of the face are often observed together with symptoms of cerebral anæmia, headache, dizziness, swimming, and tendencies to faint, especially on any sudden alteration of position, as in getting out of bed, or rising suddenly from a reclining position. Palpitation may arise on the slightest exertion, and **pain** referrible to the cardiac region is especially prone to occur in aortic cases with failing compensation. This pain may be limited to the cardiac region, but more commonly it radiates into the neck and down the arms and into the fingers, especially of the left side. Attacks of **angina pectoris** are frequently associated with this form of valvular lesion.

As failure of compensation progresses, painful attacks of dyspnœa are liable to occur, especially during the night, with orthopnœa. Although general dropsy is rare, some œdema of the feet is common, so also is pulmonary congestion and œdema with troublesome cough. Death is often sudden, and rarely lingering as in mitral cases. Symptoms due to embolism, cerebral, splenic, and renal, are frequent, as paralysis, hæmaturia, and splenic enlargement.

As a general rule we may say that when compensation in aortic cases begins seriously to fail it is usually less remediable and more rapidly progressive than in mitral cases.

When mitral insufficiency is developed secondarily to aortic incompetence and stenosis, the series of morbid changes already described as dependent on mitral disease of course arise.

The primary **indication for treatment** in all these cases of ruptured compensation is to endeavour to restore it by raising the tone of the cardiac muscle, and in many cases, especially those of mitral lesions, we are able to do so again and again. We have already pointed out the importance, in the treatment of cardiac diseases, of *diminishing the mechanical work of the heart.* This is itself sufficient in many cases to restore the broken compensation. **Rest in bed,** with appropriate food, for a week or ten days, will frequently succeed in removing all the evidences of circulatory disturbance in chronic mitral disease. Cardiac irregularity, visceral congestions, dyspnœa, dropsy, will all disappear. Insist, then, as an essential condition to successful treatment, on *physical rest*, rest in the recumbent position, and maintain this rest until you have good reason for believing that compensation has been restored.

But we have at our disposal some very reliable medicinal resources for raising the tone of the cardiac muscle when it begins to fail, and these are the various drugs known as *cardiac tonics*, which we must now pass in review.

Of all cardiac tonics **digitalis** remains the most reliable and trustworthy. Its power of restoring tone to the enfeebled cardiac muscle is remarkable, and is unequalled by any other drug. Under its use the systolic contraction of the ventricles becomes more vigorous, the period of diastole is prolonged, and the pulse, at the same time, becomes slower and more regular as well as stronger. In mitral regurgitation the improved tone of the right ventricle raises the tension in the pulmonary veins and the left auricle, and counteracts the backward flow through the incompetent valve, and the more vigorous and complete contraction of the left ventricle causes a larger quantity of blood to be projected into the arterial system. Digitalis also acts as a tonic to the arteries, stimulating normal contraction of their muscular fibres, and so furthering a steady and continuous flow of blood onwards through the capillaries.*

It is this *twofold* tonic action on the forces of the circulation that is so valuable in digitalis, for the tonic contraction of the peripheral vessels † is an important aid to the circulation, and is especially felt in the capillaries and the venous radicles ; hence it is that digitalis acts so powerfully in the relief of cardiac dropsies, and often so largely increases the flow of urine.

A few moderate doses of digitalis combined with rest in bed will often reduce the cardiac beat from 120 or 130 to 60 or 70 in the minute.

In the advocacy of substitutes for digitalis, now so common, a great deal is often made of the so-called drawbacks and dangers attending its use. It is said to accumulate in the system, and after a time to produce *sudden* dangerous symptoms. After a long and considerable experience of its use in cardiac disease we have rarely met with such a circumstance. That it occasionally causes gastro-intestinal irritation, especially if administered unskilfully, or in too large doses, or for too long a period, is certain. But with care in its administration—*and all drugs should be administered with care*—and occasional interruptions in its use for two or three days at a time, it will be found that it very rarely disagrees.

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* Prof. H. C. Wood has shown how digitalis aids the nutrition of the heart itself : 1st, by completely emptying the vessels of the heart during the sustained and strengthened systolic contractions : and, 2nd, by promoting the more complete filling of its arteries during the prolonged diastole, and at the same time affording the necessary *rest* to the cardiac muscle. Hence the *permanent* improvement following its use.

† Sufficient distinction is not made between the obstruction to the circulation caused by *morbid spasm* of the arterioles, and the *aid* to the circulation which improved tone of their muscle affords.

In the distressing palpitation not infrequently encountered in cases of mitral stenosis in women, without other signs of failing compensation, digitalis will often produce distressing symptoms, even in small doses. One patient described its effect as making her feel "as if her heart was grasped in the hand." In such cases, if digitalis is given, the pulse may become small and irregular and the urine scanty. It is now generally admitted that this drug rarely acts well in cases of uncomplicated mitral stenosis.

Some importance must be attached to the choice of a suitable preparation of the drug and to its administration in suitable doses. The preparations usually employed are the powdered leaves, the tincture, and the infusion, and also the glucoside *digitaline.* The powder is especially prone to cause gastro-intestinal irritation, and should be avoided. Pilules of digitaline will be found useful and convenient in the slighter functional cardiac disturbances, but the glucoside has not the diuretic action of digitalis leaves. There remain the tincture and the infusion; the former is a handy and useful preparation, but a great many physicians prefer, and, we think, with good reason, the freshly-prepared infusion. Then as to the best dose. In cases where it is important to establish the diuretic action of the drug as quickly as possible, we should begin with full doses, which we can diminish when full diuresis has been established. Half an ounce to an ounce of the infusion, or 15 to 20 minims of the tincture, combined with a dram of the spirit of juniper, may be given every six hours until the diuretic action of the drug has been produced.

In cases where there is no dropsy, smaller doses, which may be continued for a considerable period, act better, and we frequently give doses of

5 minims only of the tincture and a dram or two of the infusion three times a day. If there is any tendency to gastric irritation, it is as well to combine with these small doses 20 or 30 minims of the aromatic spirits of ammonia and some aromatic water. Digitalis has also been applied in the form of poultice to the abdominal surface, either in the form of the fresh leaves macerated in boiling water, or the tincture mixed with a linseed-meal poultice. Dujardin-Beaumetz tested this method, and he found that in young subjects, with fine delicate skins, the cardiac action was distinctly lowered, but that in older subjects, with rough and coarse skins, no effect was produced.* When there is great gastric irritability, digitalis may be advantageously given by the rectum in the form of small enemata; 2 ounces of the infusion with 2 ounces of warm water may be thus administered three times a day.†

When digitalis fails, it is usually because the cardiac muscle is in an advanced stage of degeneration; then, indeed, it is useless, and its administration should not be continued.

Huchard has pointed out that *children* bear digitalis well because of the integrity of all their organs, but being a toxic drug, it should be given to them cautiously and in small doses; whereas *old people* bear it badly owing to the probable presence of lesions of the cardiac muscle and of the blood-vessels as well as of the kidneys and liver; to them it should be given, therefore, also with great caution, especially when there exist obvious signs of *arterio-sclerosis.*

Next, perhaps, in value to digitalis as a cardiac tonic we must reckon **strophanthus.** It is a direct stimulant of the cardiac muscle, and not only does it, like digitalis, regulate the cardiac rhythm, slow the pulse, and strengthen and sustain the ventricular systole, but in some cases it also, like digitalis, acts as an efficient diuretic; and, in our own experience, it is often in those cases in which digitalis fails to act as a diuretic that strophanthus succeeds. Complaint has been made of the uncertainty of its action, and it must be admitted that it is not to be so generally relied upon as digitalis, especially in serious failure of compensation. But in cases of cardiac feebleness, associated with corpulency, flatulence, and dyspepsia, or following acute illnesses, we have found it more useful and much better tolerated than digitalis. This drug is also useful as a substitute for digitalis when we think it necessary or desirable to suspend for a time the administration of the latter; and we shall sometimes find that when we have, as it were, exhausted the sensitiveness of the cardiac muscle to digitalis, it is a good plan to resort to strophanthus, and return, after a time, to digitalis. The fact that strophanthus is more entirely a *cardiac* tonic, and does not act on the arterioles like digitalis, seems to point to it as the better drug of the two in gout and other cases in which vascular tension is high from contracted arterioles.

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* "Leçons de Clinique Thérapeutique," vol. i. p. 54.

† Much larger doses than this have been given.

The action of strophanthus is not cumulative like that of digitalis, nor have we found, in small or moderate doses, that it produces, as has been stated, gastric or intestinal irritation. As to the best dose and preparation, we have found from 3 to 5 minims of the tincture every four to six hours answer well. Others have given the active principle strophanthine in doses of $\frac{1}{60}$th of a grain three or four times a day, and some, like G. Sée, prefer this.

A most valuable cardiac tonic, the use of which has been somewhat neglected in Great Britain, is **caffeine**; and in grave cases of cardiac failure its administration by hypodermic injection,* especially when from the existence of gastric disorder other cardiac tonics cannot well be given, is often attended with remarkably good results. Prof. W. H. Thomson* thinks it more useful than digitalis in the dyspnœa of mitral stenosis, and (combined with nux vomica) in cases of aortic incompetence. It is to the modern French school of physicians that we chiefly owe the advocacy of caffeine as a cardiac tonic. Experiments on animals have given rise to the most conflicting opinions as to its action on the heart and circulation. It has been said to quicken and to slow the action of the heart, and to augment and to diminish arterial tension, and we may note somewhat similar results in the use of excessive quantities of coffee in different individuals. In some it will cause very rapid cardiac action; in others it will slow the pulse, and cause cardiac intermissions distinctly sensible to the patient himself. It is to *clinical* experience, therefore, we must refer for guidance in the use of this drug as a cardiac tonic. Dujardin-Beaumetz observes that it is "especially in the last stage of cardiac disease, at the period of *asystole*, and when we have exhausted the effect of other cardiac tonics, that caffeine will be found of signal service." † He and Huchard also maintain that it has often been given in insufficient doses, and that as much as 30 grains a day must be given in order to obtain the best results. "You will," he states, "sometimes obtain truly marvellous results when everything else has failed." Whitla considers its diuretic action more rapid than that of digitalis, and he has "seen excellent results from the administration of 3- to 5-grain doses of the citrate in mitral regurgitation with much anasarca and congestion of organs, where digitalis was not well borne."

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* For this purpose, as well as for internal use, caffeine can be dissolved in sodium benzoate or salicylate in the following proportions:—Caffeine, 30 grains; sodium benzoate, 35 grains; distilled water to make 200 minims. An injection of 20 minims will contain 3 grains of caffeine.

Convallaria and the glucoside *convallamarine* have been employed as cardiac tonics, and no doubt they possess the property of augmenting the contractile force of the heart, and so promoting diuresis. They are, however, greatly inferior to the preceding, and their use should be reserved to certain cases in which these do not agree, or where, for some reason, it seems desirable to vary the treatment. A tincture of convallaria is made, of which the dose is 5 to 20 minims, three to six times a day, or convallamarine may be given in half-grain doses twice daily.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 726.

† "Leçons de Clinique Thérapeutique," vol. i. p. 62.

Sparteine is another cardiac tonic which has scarcely realised the expectations of its advocates. It is usually given in the form of sulphate, 1 to 2 grains three times a day. It has been said to produce diuresis very rapidly, but like so many other drugs of this class, its action has been found very uncertain. It has its value, however, in cardiac affections when other resources fail, or as an alternative when it is not desirable to exhaust the effect of some other drug. Some consider the rapidity of its action to especially indicate its use in acute enfeeblement of cardiac tone in acute diseases. A quarter of a grain to a grain may be given three or four times a day.

Adonis vernalis and a glucoside derived from it, *adonidine*, have also been given as cardiac tonics; the latter in doses of $\frac{1}{6}$th to $\frac{1}{3}$rd of a grain, long continued, has been found to exercise a tonic effect upon the heart analogous to that of digitalis. In large doses it is apt to cause troublesome gastric irritation.*

The "**coronilla varia**," a plant of the leguminous tribe, and its glucoside *coronilline*, have been found by some French physicians to possess a tonic action on the heart, and to be especially efficacious in the arrest and prevention of attacks of paroxysmal palpitation, but further observations are needed in corroboration of these reports.

Cactus grandiflorus is another cardiac tonic recently introduced as possessing the power of regulating and strengthening the cardiac contractions in organic and functional cardiac affections, especially the latter. It is said to have this advantage over digitalis, that it is effective in the *final* stages of heart disease. All such statements about these newly introduced drugs must be received with caution, more especially when we observe, as in two prescriptions now before us containing cactus grandiflorus, that it was combined in one with nux vomica and liquor pancreaticus, and in the other with Fowler's solution and compound tincture of gentian. We do not see how it is possible, if such combinations are given in cases of advanced valvular disease, to refer any temporary benefit that may seem to follow to one only of the ingredients.

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* Dujardin-Beaumetz, "Clinique Thérapeutique," vol. i. p. 72.

Barium chloride has been tried by different practitioners with somewhat *varying* results. It has been highly praised by some as a cardiac tonic acting as rapidly as digitalis without causing any disorder of the stomach in one-dram doses of 1 per cent. solutions; others have found it *very* uncertain!

Strychnine, quinine, coca, kola, are all valuable cardiac as well as general tonics, and they find their proper use in cases of cardiac dilatation associated with general muscular and nervous asthenia.

They do not appear to have any direct special action, like digitalis or strophanthus, on the cardiac muscle, but they act rather through their general tonic influence on the nervous centres; they are none the less valuable on that account, and we have found strychnine, quinine, and coca of the very greatest use in the treatment of cases of cardiac asthenia following acute disease; but they cannot take the place of digitalis and its analogues for the purpose of regulating cardiac rhythm and promoting diuresis in grave cases of valvular disease with failure of compensation.

There are few cases of chronic valvular disease, with failing compensation, that will not, at some period in their course, be greatly benefited by the judicious administration of some preparation of **iron.** The milder preparations usually answer best, such as the ammonia citrate, the phosphate, and the tartrate. The attention of medical practitioners has been so strongly directed of late years to other cardiac tonics that the value of ferruginous compounds is in danger of being overlooked, and it is necessary, therefore, to insist on their undoubted value and efficacy.

Finally, we must not omit to refer to the great value of mercurial aperients in the management of these cases. It is always desirable to give a pill of aloes and blue pill, or blue pill and colocynth before beginning the use of digitalis. Moreover, such aperient doses must be given frequently, in order to promote elimination, to unload the abdominal veins, to relieve thereby the right heart, and to stimulate hepatic functions.

ADDITIONAL FORMULÆ.

Cardiac tonic powders.

℞ Pulv. digitalis, 3 grains.
Quininæ sulph., 18 grains.
Pulv. rhei, 18 grains.
Sodii bicarbonat., 18 grains.

M. et divide in pulv. 10. A powder twice a day. (*Schnitzler.*)

Cardiac tonic mixture.

℞ Infusi adonis vernalis (made by infusing 60 grains of the leaves in 4 oz. of water), 4 oz.
Spir. menthæ pip., 5 minims.

M. f. mist. A tablespoonful four times a day. (*Schnitzler.*)

Sedative drops to allay cardiac excitement.

℞ Extracti belladonnæ, 3 grains
Tinct. digitalis, 2½ drams.
Aquæ laurocerasi ad 1 oz.

M. f. mist. Ten drops three times a day. (*Schnitzler.*)

Cardiac tonic.

℞ Syrupi flor. aurantiæ, 4 drms.
Infusi convallariæ majalis (made by infusing 2½ drams of the plant in 12 oz. of water) ad 6 oz.

A tablespoonful every two hours. (*Bamberger.*)

Iron and digitalis cardiac tonic.

℞ Tinct. digitalis, 160 minims.
Tinct. ferri perchlor., 3 drms.
Spr. chloroformi, 3 drams.
Glycerini pur., 1 oz.
Aquæ destill. ad 4 oz.

M. f. mist. A teaspoonful in a wineglass of water four times a day, after food. (*Whitla.*)

Caffeine mixture.

℞ Caffeinæ, 16 grains.
Sodii benzoatis, 16 grains.
Syrupi flor. aurant., 3 drams.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful for a dose.

CHAPTER III.

THE MANAGEMENT OF SPECIAL SYMPTOMS DEPENDENT ON CHRONIC VALVULAR DISEASE.

SYMPTOMS DUE TO VENOUS ENGORGEMENT—Bleeding—Purgatives—Treatment of Dyspnœa—Bronchial Catarrh and Cough—Hæmoptysis—Dyspeptic Symptoms—Dropsy—Diuretics—Milk Diet—Hydragogue Cathartics—Diaphoretics—Incisions into Subcutaneous Tissue—Multiple Punctures—Friction with Croton Oil—Paracentesis Abdominis—Massage—Treatment of Restlessness and Insomnia—Caution in Use of Opiates—Codeia—The Bromides—Sulphonal—Paraldehyde—Treatment specially appropriate to *Aortic* Lesions—Food and Regimen—Digitalis and Iron—Consequences of Hypertrophy—Arterial Strain—Anginal Attacks—Symptoms due to Cerebral Anæmia, to Hypertrophy, to Embolism—Value of Rest—Avoidance of Excitement, physical and mental—Food and Stimulants—Gentle Aperients—Digitalis—Treatment of *Attacks of Pain*—Potassium Iodide—Nitro-Glycerine—Opium and Morphine for Dyspnœa and Insomnia. Additional Formulæ.

IN the next place we will consider, in detail, the appropriate treatment of the several morbid conditions which arise in consequence of the break-down in the cardiac mechanism from failure of compensation.

In the first place there are the symptoms referrible chiefly to the pulmonary engorgement—dyspnœa, cough, hæmoptysis; and secondly those due to the over-distension of the right side of the heart, and the systemic and portal veins; cyanosis, gastro-intestinal catarrh, jaundice, albuminuria, and general dropsy.

Now some of these conditions may be relieved by diminishing the volume of blood in the heart and blood-vessels. By this means the over-distension of the right side of the heart will be relieved, and so will also the engorgement of the lungs and venous system. We may diminish the volume of blood *directly* by the abstraction of blood by **bleeding**, or *indirectly* by the withdrawal of water from the blood by means of hydragogue purgatives.

Except in hospital practice it is but rarely that occasions occur for blood-letting in heart disease.

It is not a popular measure, and the indications for its employment usually arise only in the ultimate stages of the disease when the relief afforded is but temporary, and the struggle for life is only prolonged for a brief period.

Osler considers "the abstraction of from twenty to thirty ounces of blood is indicated when signs of venous engorgement are marked, and when there is orthopnœa with cyanosis." Dujardin-Beaumetz, while approving of bleeding in similar circumstances, calls attention to its dangers: "Do not forget," he says, "that bleeding should be reserved for the grave, final stages, and that the patient often pays dearly for that factitious amelioration, which gives place, in a few days, to an aggravation of the general symptoms."

We consider that bleeding should be reserved for the relief of cases of intense dyspnœa with cyanosis, arising from distension of the right side of the heart and pulmonary engorgement, and that it should be immediately followed by cardiac stimulants and tonics, and that it should rarely exceed ten ounces at a time.* It is chiefly useful in enabling restoratives and tonics to act more efficiently, and it is more likely to answer well in young and robust subjects than in the old and debilitated, in the latter it will rarely prove a judicious expedient. By postponing for a short period the fatal event, it may, however, prove a valuable measure, in enabling the patient to transact important business which would otherwise be left undone.

There are few cases of heart disease, with notable venous obstruction, that are not greatly relieved, at some part of their course, by the administration of suitable **purgatives.**

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* We have recently had under our care a remarkable instance, in which the abstraction of a few ounces of blood (4 or 5) led to the most astonishing revival of a cardiac patient who was on the point of death. She was relieved of her breathlessness, and began to eat and drink again with appetite, and to converse cheerfully. Besides aortic obstruction and regurgitation, she had evidences of mitral stenosis, and regurgitation, and on post-mortem examination the tricuspid valve was also found to be diseased, and there was immense distension of the right auricle, which the bleeding had relieved. The revival, however, only lasted for about a fortnight.

The unloading of the portal system thus induced tends directly to the removal of the congestion of the liver and the concomitant gastro-intestinal catarrh, and so assists in the assimilation of food, while it indirectly relieves the distension of the right side of the heart, the over-loaded systemic veins, and the pulmonary congestion; ascites and general dropsy may be also greatly diminished, if not completely removed.

The purgative should be given in the early morning, when the stomach is empty; so as to avoid any disturbance of the patient during the night, and to sweep away the *débris* of food *only*, so as not to imperil the nutrition of the patient.

It is a good plan to change the purgative from time to time, for by the too long use of the same purgative agent we may either weaken its action or excite irritative gastro-intestinal catarrh.

We usually select when there is ascites either saline purgatives such as *magnesium sulphate*, or hydragogue cathartics such as scammony, jalap, gamboge, senna, and elaterium.

A large dose of magnesium sulphate ($\frac{1}{2}$ an ounce to an ounce) dissolved in as small a quantity of water as possible, should be given in the morning, fasting.

The *compound jalap powder* of the B.P. is a favourite purgative in these cases; from 30 to 60 grains may be given every morning. The compound scammony powder is also a useful purge. It may be given alone in 30-grain doses or combined with the compound jalap powder, or we may combine the *tincture of jalap*, 1 or 2 drams with 2 or 3 drams of *tincture of senna*, and give this with a little water early in the morning; or we may give 10- or 15-grain doses of a combination of equal parts of the compound colocynth and compound gamboge pill. We should reserve *elaterium* for cases in which the preceding fail, or do not cause a sufficient discharge of fluid from the bowels. It varies a good deal in its activity, and is sometimes very depressing. The *compound tincture* is a good form to use; there is $\frac{1}{8}$ of a grain in each fluid dram, and this may be given as a dose in a little water or milk and water; or the compound powder of elaterium may be given in 5-grain doses. A little ether, or sal volatile, or brandy, should be given if much depression attends its action.

In cases where these strong cathartics are not needed or are ill-borne, milder ones should be resorted to, such as the compound liquorice powder, Carlsbad salts, or colocynth and henbane pills. The cardiac patient should never be allowed to become constipated, as constipation raises the tension in the abdominal vessels, and augments the work of the heart.

As a rule these patients bear purgatives well.

Other measures may be needed to relieve the **dyspnœa, hæmoptysis,** or **bronchial catarrh,** with cough and expectoration, dependent on the pulmonary congestion. Counter-irritation is here of much service, mustard plasters or turpentine stupes, applied over a large surface of the chest, give much relief; or turpentine embrocations may be rubbed in freely. Dry cupping over the back of the chest is often of great benefit. Blisters are occasionally useful, but we usually prefer mustard plasters, as they can be frequently repeated, and they do not involve the necessity of troublesome dressings.

Hæmoptysis, unless it is excessive or dangerously prolonged, does not call for any active interference for its arrest. Its effect must be to unload the pulmonary vessels and to relieve the congestion which has induced it. Osler* mentions a medical man who had many attacks of hæmoptysis in association with mitral incompetence, and whose condition was invariably better after the attack. As, however, the symptom is usually an alarming one to the patient and his friends, they should be told that its effect is sometimes salutary; and at the same time some simple remedies may be prescribed. Perfect repose must, of course, be insisted on, and a few doses of magnesium sulphate, with dilute sulphuric acid and infusion of roses, are useful. Nervous agitation and palpitation must be allayed by some sedative, and for this purpose we may give a dose of $\frac{1}{6}$th or $\frac{1}{4}$th of a grain of morphine with a dram of cherry-laurel water.

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* "Practice of Medicine," p. 627.

We shall describe hereafter the measures for arresting hæmoptysis when it assumes dangerous proportions.

In the treatment of the **cough** of cardiac cases we should follow much the same methods as in the treatment of *chronic bronchial catarrh*, but in cardiac cases expectoration may be promoted and the cough relieved by stimulants directed to help the struggling heart, such as ammonium carbonate, with spirits of ether or chloroform, and senega, and as a drink hot milk with seltzer or apollinaris water, and a few teaspoonfuls of whisky or brandy may be given.

Stimulating expectorants, combined with *small* doses of opium, have a good effect, such as the ipecacuanha and squill pill of the B.P., or this mixed, in equal proportions, with the compound conium pill; 5 to 10 grains of either of these may be given two or three times a day.

The **gastric** symptoms dependent on congestion of the liver (which is often greatly enlarged) and engorgement of the portal venous system, such as loss of appetite, flatulence, nausea, and vomiting, are often very difficult to relieve.

It is well to begin by giving non-irritating and non-depressing aperients. Half a grain or a grain of calomel with 5 grains of colocynth and henbane pill may be given every night, and 1 or 2 drams of sodium sulphate and $\frac{1}{2}$ a dram of sodium bicarbonate in an ounce or two of hot water the first thing in the morning. For the nausea effervescing saline draughts, with an excess of sodium bicarbonate and 5-minim doses of dilute hydrocyanic acid may be given three or four times a day. Large hot linseed and mustard poultices over the right hypochondriac and the epigastric regions frequently afford great relief. The flatulence will be relieved by a grain of thymol or ½ a minim of creasote in a pill twice or three times a day after taking food. Obstinate vomiting will require the suspension of all food except a little iced milk or milk and lime water. Small quantities of iced water, or effervescing drinks such as iced champagne with apollinaris water may be given to allay thirst and to support the patient. Oxalate of cerium in 2- or 3-grain doses, mixed with a little sugar of milk, will sometimes relieve the gastric irritability in these cases after other measures have failed.

Digitalis is usually very badly borne in cases of this kind, but we can sometimes give nux vomica with advantage after the vomiting has been checked. Fifteen to twenty drops of the tincture combined with 10 or 15 grains of sodium bicarbonate should be given three or four times a day when the stomach is empty.

Great care must be observed in feeding these cases of gastric irritability. The food should be fluid or semi-fluid, in small quantity, and pre-digested. Peptonised milk or beef and chicken jelly, or peptonised gruel or cocoa, occasionally a cup of clear soup, all these may be used so as to vary the dietary.

But one of the most urgent symptoms which we have to treat in connection with venous engorgement from failure of compensation is **dropsy**, and we will now consider in detail the best measures to adopt in order to relieve the dropsy of cardiac disease.

The removal of the serous fluid which has accumulated in the subcutaneous connective tissue or in the serous cavities may be effected in various ways: (1) It may be removed by excessive *diuresis* through the agency of the kidneys; (2) it may be drained away from the intestinal vessels by hydragogue cathartics; (3) it may be got rid of, to some extent, by stimulating the cutaneous excretion, by *diaphoretics;* and (4) it may be drained off by direct puncture or incision of the skin and connective tissue, or, if the serous cavities are involved, by puncture and aspiration.

Most of those drugs which we have described as acting as **cardiac tonics** act also as **diuretics.** They raise the blood-pressure in the renal glomeruli by strengthening the cardiac contractions, and while they thus increase the flow of urine, they at the same time tend to *remove the cause* of the dropsical effusions. We usually, therefore, commence the treatment of cardiac dropsy by the attempt to excite excessive diuresis, and for this purpose we administer those drugs which act also as cardiac tonics. The diuretic effect of digitalis is sometimes most remarkable, and it is common to see a considerable amount of general anasarca disappear in a few days with rest in bed and treatment with digitalis. The fresh infusion of the leaves seems to be the preparation which has the most powerful diuretic effect. We should begin by giving a full dose, such as ½ an ounce or an ounce, three times a day, and diminish the dose as the diuretic effect becomes established. This is a better plan than to lose time by beginning with an inefficient dose and gradually increasing it. The only caution necessary is that it should not be permitted to accumulate in the system, and that it certainly cannot do at the *commencement* of its use. If digitalis fails, strophanthus may be tried in 3- to 5-minim doses of the tincture every 3 or 4 hours; this drug will, in certain cases, cause free diuresis after the failure of digitalis. *Caffeine* may next be tried, its diuretic power is often very considerable. It may be given in 3- to 6-grain doses 4 or 5 times a day, either by the stomach, dissolved in water with the aid of sodium benzoate, or by hypodermic injection. The other cardiac tonics may be tried if these fail.

It is customary to combine squill with digitalis as forming a more effective diuretic than either singly, and the addition of blue pill or calomel to a pill containing squill and digitalis has long been a favourite formula. *Calomel* itself acts as a powerful diuretic in cases of cardiac dropsy, and its employment is indicated when the class of cardiac tonics fail, or to aid them when they prove inefficient. It sometimes acts rapidly; its diuretic action is somewhat difficult *to explain*, but it is probably associated with its action on the liver and intestinal canal. It has been given, in these cases, in doses of 1½ to 3 grains, 3 or 4 times a day.* Its use should not be continued after its diuretic effect has been established. It should not be given in advanced cases. Hypodermic injections of mercuric perchloride have been given with the same object.

Potassium iodide often proves a serviceable diuretic alone or in combination with digitalis.

Diuretin, which appears to be a compound of theobromin, sodium, and sodium salicylate, has been advocated as a valuable diuretic in cardiac dropsies, chiefly by German and American physicians. Cases have been published in which its diuretic power has been reported as marvellous; at the same time it is not pretended that it can take the place of digitalis or other cardiac tonics, but rather that it may be used in the place of such a diuretic as calomel and with more safety. It is given in doses of 15 grains every four or five hours. It is said to be a very unstable preparation and that it readily decomposes, and this fact may account for the conflicting estimates of its value that have been published. Moreover, it is costly.

The value of an **absolute milk diet** in the treatment of some forms of cardiac disease has been referred to the diuretic action of the *lactose* contained in the milk, and Prof. G. Sée has strongly recommended the administration of lactose as an efficient diuretic in cases of cardiac dropsy; but we note that not only does he advise the combination of potassium iodide with the lactose, but that he orders as much as

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* On the Continent it has been given in very large doses, even to the production of diarrhœa and salivation. It is said that it is only in such large doses that its diuretic effect is produced. We have seen ill effects follow this practice.

1,500 grains of the latter to be given daily, dissolved in no less than 2 litres of water!

To run all this water through the kidneys daily might in itself be sufficient to excite diuresis, especially with potassium iodide dissolved in it, but if only the same amount were secreted as administered it would give the appearance of free diuresis!

It is often found that a combination of diuretics will answer better than either alone. Some of the most useful of these combinations will be found amongst the formulæ at the end of this chapter.

The effect produced by diuretics will depend, as Dujardin-Beaumetz has pointed out, on the condition of the heart and the kidneys. If the cardiac muscle is in a state of advanced degeneration, and if the kidneys are also unsound, very little good can be expected of them.

When diuretics fail to relieve the dropsy, recourse is had, in the next place, to those *hydragogue cathartics*, the use and application of which we have already described, and it often happens that after a certain amount of the dropsical exudation has been removed by the action of these drugs, diuretics will be found to have recovered their power and may be re-administered with advantage.

Useful as **diaphoretic** measures prove in the treatment of renal dropsies, they are of little efficacy in the removal of those of cardiac origin, and when diuretics and cathartics fail us we have only one other resource left, viz. to drain away the dropsical fluid by punctures or incisions into the subcutaneous tissue; or, in dropsy of the peritoneum or other serous cavities, to remove the fluid by paracentesis.

These measures are often needed in the last stage of heart disease to relieve the distress of the patient from the enormous swelling of the legs, which may become quite immovable, or from the great accumulation of fluid in the abdominal cavity preventing the descent of the diaphragm. It is remarkable the relief that is afforded by these measures in some cases, and when accompanied or followed by appropriate tonic and supporting remedies, the patient is occasionally restored for a time to comparative comfort.

There are different methods of effecting this drainage; some make free **incisions** half an inch to an inch in length through the skin and subcutaneous tissue over each malleolus; the legs are kept in a dependent position and the patient's body is raised into the sitting or semi-recumbent attitude. Large quantities of fluid will thus be drained away, to the great relief of the patient. Most careful antiseptic precautions must be followed in the performance of this operation; the skin must be cleansed by washing it with soap and then with an antiseptic solution, and after the incisions have been made the legs must be wrapped in flannel soaked in antiseptic fluid. Without such minute care, and in some cases in spite of it, owing to the low vitality of the skin, inflammation and sloughing will attack these wounds.

Less risk is thought by some to attach to **multiple punctures,** made with the same antiseptic precautions, either with the point of a bistoury or with a suitable needle, thoroughly cleansed by being passed through the flame of a spirit lamp, and also dipped in antiseptic fluid. The patient should be seated, when practicable, in an easy reclining chair, and his feet placed in a tub containing a few inches of warm water saturated with boric acid, and from 15 to 20 punctures should be rapidly made between the knee and ankle. Fluid will usually flow rapidly from these punctures. The legs should then be enveloped in antiseptic wool or other appropriate antiseptic dressing, which should be maintained in position by a light flannel bandage. Small multiple punctures thus made and carefully treated usually heal readily.

Some recommend the use of what are called "Southey's tubes," small perforated silver cannulæ, which are introduced through the skin into the subcutaneous tissue, and attached to a length of fine indiarubber tubing through which the fluid may be conveyed away into a suitable receptacle. These are intended to avoid the discomfort and trouble attending the continued escape of large quantities of fluid from the patient's legs, especially when he is confined to bed and cannot sit up; but they do not always act so well as multiple punctures.

It will occasionally happen in old cardiac cases that the areolar tissue of the legs has become so indurated that no fluid escapes on puncture, and we must be prepared for a disappointment of this kind.

In order to avoid puncture Trousseau suggested friction of the skin with a few drops of **croton oil,** which gives rise to numerous small vesicles, and their rupture allows of the free escape of fluid; but aseptic puncture seems a preferable method, as croton oil *inflames* the skin, and is more likely to cause sloughing.

In some cases of cardiac dropsy a large accumulation of fluid occurs in the peritoneal cavity, embarrassing the respiration and circulation by pressing up the diaphragm, seriously interfering with the renal functions by pressure on the kidneys, and by compressing the abdominal veins further retarding the return of blood from the lower extremities. In these cases of *cardiac ascites*, when other measures, such as we have described, fail to make any impression on the amount of fluid, and serious consequences threaten from the pressure it is causing on surrounding parts, *paracentesis abdominis* should be performed for the removal of at least a portion of the fluid; firm pressure should also be applied to the external surface of the abdomen by a flannel binder both during and after the withdrawal of the fluid. If such pressure is properly applied and maintained there will be little risk of syncope. Some diffusible stimulant should be given to the patient before the operation. It will often be found that when the pressure of the ascitic fluid is removed from the kidneys and the abdominal veins the action of diuretics and purgatives may be re-established, to the great advantage of the patient.

Passive effusions into one or other pleural cavity (*hydro-thorax*), when of sufficient amount to interfere seriously with respiration, must be removed, at any rate in part, by puncture and aspiration.

Massage has been applied successfully to relieve the œdema of the extremities, and also the ascites of cardiac disease when not too far advanced. The tendency to stasis in the venous capillaries is remedied to some extent and the return venous circulation promoted by suitable manual compression and stroking of the surface as in massage. Massage of the extremities may be accompanied by abdominal massage "and percussion and strong stroking over the kidneys"; diuresis is thus established, and the œdema of the feet and legs in the early stages may often be caused to disappear; but less effect is observed to follow when there is much ascitic fluid in the abdominal cavity, doubtless because in these cases the cardiac failure is more serious, and the lesion less remediable.

The **cerebral congestion** dependent on venous stasis in advanced *mitral* disease may be attended with various unpleasant symptoms, none, however, more distressing to the patient than the restlessness and *insomnia* it sometimes induces. There is much difference of opinion as to the propriety of administering opium or morphine in these cases. In *aortic* cases, to the treatment of which we shall presently refer, where there is *cerebral anæmia*, opium is a far more suitable remedy for cardiac sleeplessness, than in mitral cases, with cerebral venous congestion.

But whenever the cardiac muscle is thin and weak there is danger in the use of opium. It is true it answers well with some persons, who are not very sensitive to its depressing after-effect, but in others we must not be surprised if we find the use of opium has simply promoted euthanasia. If we are compelled to have recourse to morphine, as is sometimes the case, we should give it in small doses, not more than the $\frac{1}{8}$th or $\frac{1}{6}$th of a grain at a time, and combine it with some stimulant such as the aromatic spirits of ammonia and the spirits of ether. Others are less reserved in their use of opium in cardiac cases; Whitla remarks, "sleeplessness may be met by opiates . . a $\frac{1}{6}$ to $\frac{1}{3}$ grain of morphia hypodermically often acts most beneficially," and he does not distinguish between aortic and mitral cases. In mitral cases congestion of the liver and defective bile secretion are almost always present, and the latter is always aggravated by opium.

If there should also be some renal complication, opium is still more dangerous. The safe use of opium in cardiac disease requires, in our opinion, the greatest skill and discrimination. *Codeia*, in quite small doses, answers well in some cases. In a case of combined aortic and mitral disease under our care it never failed to procure sleep during the last two years of the patient's life. *Chloral* is a most unsafe drug on account of the cardiac depression it causes.

Potassium or sodium bromide is one of the safest remedies for the insomnia of mitral cases. It may be three or four days, as Dujardin-Beaumetz* points out, before it produces its calming effects. We have often found a combination of 20 grains of sodium bromide and a dram of tincture of hops in an ounce of chloroform water answer well as a hypnotic in these cases. *Urethane* we have found a very uncertain hypnotic. *Sulphonal*, however, is useful, but it acts slowly and it is best to give it about an hour before the last meal of the day in order to obtain its hypnotic effect during the night. *Paraldehyde* may also be used.

Hitherto we have been considering chiefly the treatment of *mitral* lesions and the circulatory disturbances they involve. It will be convenient now to examine the treatment adapted to the effects of *aortic* lesions which have not yet led to secondary insufficiency of the mitral, for in the latter case the preceding considerations would be as applicable as to cases which were primarily mitral.

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* This author has a very high opinion of the value of potassium bromide in mitral affections. "It will," he says, "bring calm and repose; it will regulate the cardiac beat, diminish nervous irritation so common with cardiac patients, and thus will combat the fatiguing sleeplessness which exhausts such patients."

Aortic stenosis without insufficiency is the least serious of all valvular affections. The induration of the valves upon which it depends is usually associated with general arterio-sclerosis and not on endocarditis, and it is, therefore, commonly a disease of advanced age. When the obstruction is but slight it is usually completely compensated by a small amount of ventricular hypertrophy, and the patient may be for many years free from any subjective symptoms and unconscious of the existence of any valvular lesions. When this is the case no active treatment is necessary, or only such as may be required by any co-existing general arterio-sclerosis, or gouty, or other blood states.

If, on the other hand, the stenosis is considerable and imperfectly compensated by the ventricular hypertrophy, symptoms dependent on scanty filling of the arteries arise, such as pallor of the face, a tendency to syncope, giddiness, loss of memory, disturbances of vision and hearing, and other signs of cerebral anæmia.

The indication for **treatment** in these cases is to maintain or improve the nutrition of the cardiac muscle and to prevent degenerative changes, therefore the most suitable treatment for this state is mainly regiminal. Regular gentle exercise may be permitted, but all physical and mental exertion or excitement should be guarded against. Complete physical repose may at times be beneficial. Being much in the open air when the weather is propitious is advantageous for its tonic restorative oxygenating influence. The diet should be nutritious, but it should bo carefully adapted to the digestive capacities of the patient. When a diet largely composed of milk is well borne and agreeable to the patient, it should be recommended. Animal food, fish, and game in moderation may, however, suit other cases better. Purées of vegetables are most useful for the avoidance of constipation, and a small quantity of sound wine, or spirits and water, may be prescribed with advantage, especially for the aged.

If with other signs of imperfect compensation we observe increased rapidity of cardiac action, with a small, quick pulse of low tension, indicating that the ventricular systole is too brief for the ventricle to completely discharge its contents through the stenosed orifice, we should give digitalis in small doses—5 to 10 minims of the tincture three times a day, and we may often usefully combine with the digitalis small doses of iron, such as 5 grains of the ammonio-citrate.

Aortic insufficiency is, perhaps, the most serious of all valvular lesions. The seriousness of the lesion is, however, dependent on the amount of regurgitation which the incompetent valves allow of during the ventricular diastole. It is almost invariably accompanied by considerable ventricular hypertrophy, and when this form of valvular disease occurs in the young and vigorous, the extent of the hypertrophy may be taken as an index of the amount of the regurgitation. Aortic insufficiency necessarily causes the left ventricle to receive two currents of blood during its diastole, one proceeding from the left auricle—a direct current—the other from the imperfectly-closed aortic orifice—a backward current. If this back flow be but small in amount, the contents of the left ventricle will be but slightly augmented, and its consequent dilatation and hypertrophy will be inconsiderable, but if the backward (regurgitant) current be large in amount, the contents of the left ventricle will be greatly increased, and its consequent dilatation and hypertrophy will be very considerable. So we may generally conclude that an enormously hypertrophied heart associated with the signs of aortic insufficiency points to a large regurgitant current through the incompetent valves. This great dilatation of the left ventricle may lead to the development of secondary mitral insufficiency, and thus we shall have the same series of morbid changes, on failure of compensation, which we have already traced. But we are now dealing with those cases of aortic insufficiency in which the mitral valve remains competent. Owing to the enormous dilatation and hypertrophy of the ventricle which occurs in many cases of aortic insufficiency a very greatly increased volume of blood is discharged, with greatly increased force, into the aorta and the arterial system at each ventricular systole. This produces a certain constantly-recurring strain on the arterial walls, leading to chronic inflammation and induration of their coats, and, in the case of the aorta, often to great dilatation. The occurrence of *anginal* symptoms, or *pain* in the cardiac region, is a common incident in these cases, a subject to which we shall have to return hereafter.

A great amount of regurgitation through the aortic valves must necessarily affect the cerebral circulation, the sudden emptying of the large vessels which convey blood to the brain, from the reflux through the incompetent aortic valves, leads to symptoms dependent on cerebral anæmia; sustained intellectual effort becomes difficult, and great irritability of temper is often noticed. Any sudden change of position, especially from the recumbent to the erect position, is apt to be attended with giddiness or even fainting, and sudden fatal syncope is not uncommon. Certain symptoms may be caused by the concomitant cardiac hypertrophy, such as headache, dizziness, disturbance of vision, or even paralysis from cerebral hæmorrhage. Symptoms due to embolism are also especially prone to occur in advanced stages of aortic disease. Emboli may be carried into the cerebral vessels or into those of the spleen, liver, or kidneys. Against some of the symptoms which may arise from failure of compensation in aortic valve disease we have no remedies; but for others, and especially for those dependent on cerebral anæmia, we may do much by judicious management. Rest in the recumbent position and the avoidance of all physical and mental excitement are of great value. Supporting food and a moderate amount of alcoholic stimulants are necessary. At the same time the bowels should be kept regularly relieved by gentle aperients.

Some differences of opinion exist as to the propriety of giving digitalis in cases of aortic regurgitation with failing compensation. It has been urged in opposition to its use that by prolonging the diastolic period such a fall in blood-pressure may be induced as to incur the danger of fatal syncope. But we believe the true test of the value of digitalis in these cases is the state of integrity of the cardiac muscle. If it is the seat of advanced degenerative changes (and this is not inconsistent with enormous increase in size), then digitalis will be of little use ; but if the cardiac muscle is fairly sound, and in a condition to respond to the tonic effect of digitalis, we believe that the sustained systolic contractions promoted by the judicious use of this drug will far more than compensate for the prolonged diastole. Moreover, it must be borne in mind that a *flabby* muscle will offer no resistance to over-distension from a considerable back-flow, but, on the other hand, a fairly sound ventricular muscle contracting vigorously under the tonic influence of digitalis, and better nourished by improved intracardiac sanguification, is much less likely to yield to the disturbing effect of the arterial reflux than a flabby muscle with no such sustaining help, and therefore the emptying of the arteries would be greater in the latter than in the former case. And further, these considerations are consistent with clinical observation. In subjects of aortic regurgitation attacked with palpitation from failing heart power, we have seen the most striking improvement follow the regulating effect of a few doses of digitalis, together with recumbency. Ten minims of the tincture, with 30 minims of aromatic spirits of ammonia and 20 minims of spirits of ether or chloroform may be given every five or six hours.

Prof. W. H. Thomson strongly advocates the combination of **nitro-glycerine** with digitalis for the purpose of correcting the contracting effect of the latter drug on the arterioles, and with these two he combines strychnine and nux vomica. His prescription is 10 minims of tincture of digitalis, 10 minims of tincture of nux vomica, and $\frac{1}{90}$th grain of nitroglycerine for a dose.*

Two valuable papers on the action of digitalis in aortic regurgitation have been published recently, one by Dr. Burr, of Leeds, † and the other by Dr. Balfour, of Edinburgh. ‡ The former very justly observes that the objection to the use of digitalis in aortic disease is rather the consequence of the *à priori* teaching of pharmacology than the outcome of clinical experience, and he expresses his strong conviction, the result of "a fairly large experience," that, given in efficient doses, "digitalis is just as much a remedy for aortic as it is for mitral disease."

For Dr. Balfour's elaborate and convincing argument in favour of the use of digitalis in aortic disease we must refer to the paper itself, but we may quote his conclusion. "When," he says, "from any cause compensation is ruptured, an aortic heart will be found as amenable to the beneficial influence of digitalis as any other failing heart, but larger doses are required; but little influence is produced by less than three times as much as would suffice for a mitral heart. Even should the pulse under treatment become abnormally slow, which is not at all usual, and certainly not needful to secure benefit, we may rest assured that excessive regurgitation is not then promoted, and though sudden death is not at all unlikely to happen, in a badly compensated aortic heart, whether it is treated with digitalis or not, digitalis is never to blame for this. On the contrary, the judicious use of digitalis is the most efficacious treatment in all cases of failing heart, whether that failure be accompanied by aortic or mitral regurgitation. In failure dependent on arterio-sclerosis alone, the tonic influence of digitalis on the heart is hindered, unless we combine with it some drug which unlocks the arterioles, and so prevents an increase of blood-pressure, already abnormally high." We would only add to this that the dose of digitalis should be carefully watched, as it is undesirable in these cases to slow the pulse *too much.* When we have brought it down to 60 or 70, we should diminish the dose of digitalis, and when giving large doses we should keep the patient *recumbent* in bed, for there is much more danger in greatly prolonging the diastole, when the patient is in the upright position, with excessive regurgitation, owing to the risk of completely emptying the cerebral vessels.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 725.

† *British Medical Journal*, March 12, 1892.

‡ *British Medical Journal*, June 4, 1892.

For the relief of the attacks of paroxysmal **pain,** often of a truly anginal character, which frequently occur in aortic cases, we shall require to have recourse to various remedies. Potassium iodide in full doses, 10 grains three times a day, is often very efficacious. *Nitro-glycerine,* of the effects of which we shall speak more fully when considering the treatment of angina pectoris, may also be given, in many cases with benefit. If the pain resembles that of aortic aneurism, the abstraction of 4 to 6 oz. of blood has sometimes been found effectual in relieving it.

But for the relief of this symptom, as well as the **dyspnœa** and nocturnal **sleeplessness** of aortic insufficiency, we shall often be obliged to have recourse to the preparations of opium or morphine; and in order to avoid as much as possible their remote depressing effects it is well to combine them with ammonia and ether. There is not the same objection to the use of opium in these aortic cases as in those of mitral disease, with pulmonary engorgement and dropsy, as we have already pointed out. Many authors maintain that opium increases the amount of blood circulating in the brain, and therefore relieves the cerebral anæmia. But we believe the beneficial action of opium in these cases to be chiefly due to its sedative, regulating effect on the excited cardiac muscle. It steadies the heart, and enables it to do its work more effectively, and it removes cardiac and cerebro-spinal hyperæsthesia. In this way, no doubt, it may *indirectly* improve the cerebral nutrition. It is well to use small doses at first, and to administer some alcoholic stimulant at the same time. An eighth or a sixth of a grain of sulphate of morphine, with $\frac{1}{160}$th grain of atropine, may be given hypodermically every five or six hours. If we give it by the mouth, it is desirable that the stomach should contain little or no food, so that the remedy may be quickly absorbed and stomach digestion not be interfered with. We may give a draught containing 25 minims of liquor morphinæ hydrochloratis, or 10 minims of the liquor opii sedativus, with 20 minims of spiritus ætheris comp., in an ounce of peppermint water, and repeat the dose in six or eight hours, if necessary.

It must be borne in mind that it is never safe to give even small doses of opium or morphine when there are evidences of renal changes. At all times we prefer codeia, and it should be tried before we have recourse to morphine. Some give 20-grain doses of chloralamide, and others have recommended tincture of henbane in hot brandy and water. Attacks of cardiac asthma from aortic incompetence are often relieved by alcohol; strychnine in combination with sal volatile and Hoffman's anodyne has also been found of value in the same cases. Rosenbach recommends inhalation of chloroform. The ordinary æther and ammonia mixture is useful but evanescent.

ADDITIONAL FORMULÆ.

In aortic incompetence, with congestion and œdema of lungs and bronchial catarrh.

℞ Ammonii carbonatis, 1 dram.
Tincturæ hyoscyami, 4 drms.
Potassii iodidi, 1 dram.
Tincturæ digitalis, 1 dram.
Infusi calumbæ ad 6 oz.

M. f. mist. A tablespoonful every four hours. (*Balfour.*)

For pain in chronic valvular disease.

℞ Tinct. digitalis, 2½ drams.
Potassii iodidi, 3 drams.
Extract. cocæ liquid., 2 oz.
Spr. ætheris nitrosi, 1 oz.
Aquæ et glycerini ad 4 oz.

M. f. mist. A teaspoonful in two tablespoonfuls of water four times a day after food. (*Whitla.*)

Diuretic mixture in heart disease.

℞ Potassii iodidi, 1½ dram.
Spr. ammoniæ arom., 4 drs.
Succus scoparii, 1½ oz.
Tinct. digitalis, 2 drams.
Infusi senegæ ad 6 oz.

M. f. mist. A tablespoonful in water every six hours.
(*Whitla.*)

Diuretic mixture in cardiac disease.

℞ Potassii citratis, 3 drams.
Spr. juniperi comp., 6 drams.
Tinct. digitalis, 2 drams.
Infusi buchu ad 6 oz.

M. f. mist. Two tablespoonfuls three or four times a day.
(*Fothergill.*)

For mitral disease, with bronchial catarrh and dropsy.

℞ Tinct. scillæ, 2 drams.
Tinct. digitalis, 2 drams.
Aquæ cassiæ ad 6 oz.

M. f. mist. A tablespoonful every four hours. (*Balfour.*)

Diuretic calomel powders.

℞ Hydrarg. subchlor., 3 grs.
Extr. opii pulv., ⅙ to ¼ grain.
Sacchari alb., 5 grains.

M. f. pulv. To be taken three times a day for three days; then suppressed for three or four days, and renewed, if well borne. (Use a chlorate of potash gargle at same time.)
(*Bamberger.*)

For bronchial catarrh of cardiac origin.

℞ Quininæ sulph., 8 grains.
Acidi benzoici, 3 grains.
Sacchari alb., 75 grains.

M. et divide in pulv. 6. A powder every two hours.
(*Bamberger.*)

Mixture for the same.

℞ Pulv. ipecac., 15 grains.
Pulv. digitalis, 15 grains.
(Infuse in)
Aquæ, 6½ oz.
Potassii acetatis, 2 drams.
Oxymel scillæ, 5 drams.

M. f. mist. Two tablespoonfuls every two hours.
(*Bamberger.*)

CHAPTER IV.

THE TREATMENT OF CARDIAC HYPERTROPHY AND DILATATION; AND OF DEGENERATIONS OF THE MYOCARDIUM.

Primary Cardiac Hypertrophy rare—Causes—Symptoms—*Treatment*—Regiminal and Dietetic—The "Grape Cure" and "Whey Cure"—Usefulness of mild Aperients—Digitalis to be avoided—Aconite and Veratrium viride—*Simple Dilatation and Cardiac Strain*—Causes—Excessive Physical Exertion—Malnutrition—Exhaustion of Acute Disease—Tobacco—Anæmia—*Symptoms*—*Treatment*—Rest—Sea Voyage—Hydrotherapy—Open-air Life—Nutritious Diet—Suppression of Tobacco—Cardiac Tonics—Formulæ—Importance of Rest and careful Feeding in advanced Cases—Milk Diet—Advantage of Aperients—Formulæ.

DEGENERATIONS: Fibroid Degeneration—Fatty Degeneration—Causes—Symptoms—*Treatment*—Digitalis—Rest—Food—Stimulants—Strychnine—Formulæ—Free Aëration—Iron—Aperients—Sedatives for Restlessness and Insomnia—*Fatty Overgrowth:* Causes—*Treatment*—Dietetic—Mineral Waters—Exercise—*Oertel's Cure.* Additional Formulæ.

WE must next refer briefly to the treatment of certain chronic changes in the walls of the heart, occurring independently of any valvular lesion, such as **hypertrophy, dilatation,** and **degenerations.**

Hypertrophy of the heart, independent of some obstruction in the course of the circulation, is a comparatively rare affection. As we encounter it clinically it is usually a consequence either of valvular disease or of some obstruction in the peripheral vessels, such as general arterial sclerosis, and this may be caused either by changes originating primarily in the walls of the vessels or may be secondary to some morbid state of the blood, as in syphilis, gout, and chronic Bright's disease.

But cardiac hypertrophy does occasionally occur as a primary disease, and it is then usually caused by agencies which excite the heart to over-action. Nervous excitement may do this, by causing habitually increased cardiac action. The excessive use of tea, coffee, alcohol, and tobacco, and habitual excess in eating and drinking generally, and sexual excesses, lead to cardiac hypertrophy from over-action. Excessive muscular exertion, as in rowing, climbing, and other athletic sports and exercises, or in certain laborious occupations, has a twofold influence in exciting cardiac hypertrophy; first, by increasing the action of the heart and causing palpitation, a condition which in some cases continues after the exciting cause has been removed; and secondly, by the obstruction to the peripheral circulation and heightened blood-pressure caused by undue compression of the small arteries and capillaries during the excessive and sustained muscular contractions.

It must be borne in mind that while muscular compression of the blood-vessels by increasing the blood-pressure excites cardiac hypertrophy, this hypertrophy itself tends to still further increase the arterial tension, and the blood-vessels exposed to this additional strain become the seat of chronic inflammatory changes, so that cardiac hypertrophy, besides being a consequence, is also a cause of arterio-sclerosis.

When cardiac hypertrophy is simply compensatory, as in certain valvular lesions, no subjective symptoms arise as a consequence of the hypertrophy, and no treatment need be devoted to it; but when hypertrophy results from abnormal morbid excitement of the cardiac action, then certain characteristic symptoms may arise and call for treatment. Palpitation is one of these, flushing of the face, spots before the eyes, noises in the ears, headaches, giddiness, these and other symptoms are dependent on overfilling of the cerebral vessels, and this may, in certain rare cases, lead to cerebral hæmorrhage and apoplexy.

The **treatment** of simple cardiac hypertrophy of this form is chiefly reginimal and dietetic. All causes of excitement must be removed. Athletic exercises and laborious occupations must be stopped. A wholesome out-of-door life, with strictly moderate and tranquil exercise and much rest in the horizontal or semi-horizontal position, should be enjoined. Daily cold affusions or sprinkling, especially to the head and spine, are useful as calmatives, and good results have been observed to follow the application of a vessel filled with ice-cold water over the cardiac region.

The strictest moderation in diet must be enforced. Animal food should be taken only in small quantities, and fresh vegetables, well cooked, should enter largely into the daily dietary. All alcoholic stimulants should be prohibited, as well as the use of tea, coffee, and tobacco. The amount of fluid consumed should not be great, and should be confined to the wants of the system, as it is undesirable to over-distend the blood-vessels with fluid. Ripe cooling fruits may, however, be permitted. The "grape cure" has been advocated in these conditions, but when large quantities of grapes are consumed daily, other food must be restricted to within very narrow limits. The "whey cure" has also been found useful. We must watch that the diet prescribed be readily and easily digested, and if it cause flatulent distension it must be suitably modified. If there is any tendency to abdominal plethora, free daily evacuation of the bowels will be a necessary measure in order to remove pressure from the abdominal vessels. A mild aloetic pill at night and a teaspoonful of Carlsbad or Homburg salts the following morning, in half a tumblerful of cold water, will usually fulfil this indication.

We must be careful not to give digitalis to check the palpitation of simple cardiac hypertrophy.

Small doses of aconite and of veratrum viride have been advocated to diminish blood-pressure, and to act as cardiac sedatives in these cases, but we have never seen the necessity of drug treatment of this kind in cases of cardiac hypertrophy, and we should much prefer relying on such general measures as have already been indicated.

We must next consider the treatment of **dilatation** of the heart, unconnected with valvular lesions.

The most common cause of simple *dilatation* of the heart is *diminished resistance* in its walls from impairment of muscular power. This state is a common sequel of exhausting diseases, as the infective fevers and influenza, or of any condition which has lowered the general nutrition, as anæmia, hæmorrhages, privation, etc. It is apt to follow pericardial adhesions, and the changes in the cardiac muscle which accompany acute endocarditis and pericarditis.

It may also arise from *increased pressure* within the cavities of the heart, but in that case the dilatation is rarely simple; it is then usually accompanied by hypertrophy, unless the increased pressure should be associated with diminished resistance, and then the dilatation will be simple and rapid, as happens when severe muscular exertion is attempted by persons in weak or failing health, or as in overworked men of middle age, who try to "walk themselves into condition" during an autumn holiday, when their condition is one requiring prolonged physical rest.

The same may be observed in feeble youths who attempt to emulate the physical exploits of their stronger comrades. In the working classes excessive labour, with insufficient food, may lead to similar results.

In all such cases increased pressure within the heart is associated with diminished resistance in its muscular walls. Attacks of influenza are especially prone to be followed by cardiac dilatation from such causes. Dilatation and symptoms of "**cardiac strain**" are also observed, not infrequently, both in youth and middle age from the abuse of tobacco. Young men, in apparently good health, and in active exercise, will occasionally, and somewhat unaccountably, suffer from attacks of palpitation and faintness, and on examination the physical signs of cardiac dilatation will be found. Such a condition is sometimes found associated with habits of sexual excess or masturbation, or simply from an amount of physical exertion in excess of their physical powers; but in cases where none of these causes exist we shall often be able to trace the cardiac dilatation either to the *excessive use* of tobacco or to its *persistent use* by young men who are constitutionally sensitive to its depressing effects. In middle-aged men, after smoking for 20 or 30 years without obvious ill-effect, it will not seldom happen that symptoms of cardiac dilatation appear somewhat suddenly, and it may be difficult to convince them at first that it is due to the tobacco which they have used so long with impunity.

Anæmia, nervous excitement, faulty habits of life, especially with respect to food and exercise, are common causes of cardiac asthenia and dilatation in women. Indeed, whatever leads to defective nutrition of the cardiac muscle must predispose to dilatation.

Dilatation, accompanied with more or less hypertrophy, is often observed as a result of the over-exertion attending certain occupations, as in soldiers after forced marches or from excessive drill, and in miners and others engaged in very laborious occupations.

The chief **symptoms** of cardiac dilatation and asthenia are recurrent attacks of palpitation and irregular action of the heart, on any exertion; they often also occur at night, causing the patient to awake from sleep in much alarm. Dyspnœa on walking up hill or ascending stairs, or on making any muscular effort, is also common. In females complaint of cardiac *pain* is frequent and on deep pressure over the cardiac apex with the point of the finger some hyper-sensitiveness of the cardiac muscle can often be made out. Liability to fatigue on slight exertion, with languor and feebleness both physical and mental, accompany most cases. The pulse is usually quick and compressible.

The **treatment** of these forms of cardiac dilatation must, in the first place, consist in the withdrawal of the patient from the influence of all those conditions which have caused it. In those cases in which over-exertion has led to cardiac strain we must insist on the avoidance of all kinds of muscular effort, gentle exercise alone being permitted, and this restriction must be enforced for an adequate length of time. A sea-voyage is often the best of remedics in these circumstances, as physical rest in good air is on board ship unavoidable. When this condition has been induced by over-excitement, emotional or mental, or by addiction to evil habits, these causes must be sought out and corrected. A course of *hydrotherapy*, in a well-ordered hydropathic establishment, will often prove of great value in such cases. An open-air life, a proper amount of exercise, always stopping short of fatigue, a nourishing but light and digestible diet, regular attention to the bowels, and early retirement to rest, are remedial measures too obvious to need insisting upon. When the disease can be traced to the use of tobacco this must be wholly forbidden, and the rapid improvement in health which usually follows the relinquishment of this habit will rarely fail to reconcile the patient to the sacrifice.

Some **cardiac tonic** will generally be advisable and will, indeed, be indispensable in those forms of cardiac dilatation and feebleness which occasionally follow attacks of acute febrile and septic maladies, and also in anæmic cases. It will rarely, however, be necessary to have recourse to digitalis except when there is much dyspnœa and troublesome palpitation. In such cases small doses of digitalis may be given in combination with iron, such as:—

℞ Ferri et ammonii citratis	80 grains.
Tinct. digitalis	40 minims.
Spr. ammoniæ aromat.	2 drams.
Infusi calumbæ	ad 8 oz.

M. f. mist. Two tablespoonfuls twice a day an hour after meals.

We, however, prefer, in the less serious forms, to employ strophanthus, or strychnine, or nux vomica, with coca in combination with iron, quinine, or arsenic as may seem desirable. We have found one or other of the following formulæ very serviceable :—

℞ Quininæ sulph.	16 grains.
Tinct. nucis vomicæ	2 drams.
(Or tinct. strophanthi	24 minims.)
Ext. cocæ fluid.	4 drams.
Spr. chloroformi	80 minims.
Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls twice a day an hour before food.

Or,

℞ Ferri et quininæ citratis	80 grains.
Liq. strychninæ	32 minims.
Spr. chloroformi	80 ,,
Aquæ	8 oz.

M. f. mist. Two tablespoonfuls twice a day two hours after food.

Or,

℞ Ferri arseniatis	4 grains.
Quininæ valerianatis	āā 24 grains.
Ext. nucis vomicæ	

M. et divide in pil. 24. One three times a day after food.

In purely anæmic cases iron and nux vomica, together with some aperient to ensure a regular action of the bowels, will be most serviceable, as :—

℞ Ferri sulphatis exsic.	36 grains.
Saponis	18 ,,
Pulv. nucis vomicæ	24 ,,
Aloes extracti	12 ,,

M. et divide in pil. 24. One or two (as necessary) twice daily, after lunch and dinner.

In cases of somewhat acute dilatation, however induced, the hypodermic injection of strychnine in doses of $\frac{1}{60}$th to $\frac{1}{20}$th of a grain will sometimes be attended with remarkably good results.

In extreme cases of cardiac dilatation the same series of morbid phenomena indicative of cardiac failure will be encountered, as we have already described in non-compensated valvular disease, and the same treatment will be needed. But in these grave instances of cardiac dilatation the ventricular muscle will usually be found to be in a state of advanced degeneration, and digitalis and other cardiac tonics will usually fail in producing any restorative or strengthening effect on it. Our chief resource in such a case must be the **most absolute repose**, with careful attention to the general nutrition. Light, easily digested, or pre-digested, highly nutritious food must be prescribed—such as pounded meat very lightly cooked, beaten-up eggs, chicken and game panada, a little white fish when agreeable, milk, and a small quantity of good sound wine, or a little weak brandy or whisky and water. A regular action of the bowels must be maintained by suitable mild aperients.

Free action of the bowels is very advantageous in nearly all cases of cardiac dilatation and feebleness, as we have previously explained. Aperients should, however, be so given as to clear away only the residue of digestion. For this purpose the best method is to give an aloetic pill after dinner or at bed-time and a saline dose early in the morning, about an hour before breakfast. Careful attention must, of course, be given to the individual sensitiveness to aperient medicines. The following will be found applicable to most cases:—

℞	Ext. aloes	12 to 24 grains.
	Ipecacuanhæ pulv.	6 ,,
	Saponis	6 ,,
	Ext. hyoscyami	3 ,,

M. et divide in pil. 12. One every night, or after late dinner.

(In some cases it may be necessary to add to each pill $\frac{1}{8}$th grain of podophyllin, or $\frac{1}{2}$ grain of calomel.)

℞	Sodii sulph.	1 to 2 drams.
	Sodii bicarb.	20 grains.
	Sodii chloridi	10 ,,

M. f. pulv. To be given early in the morning, after the pill, dissolved in half a tumblerful of hot water.

Degenerations of the cardiac muscle do not offer much scope for therapeutic management: some forms, described as "*fibroid* disease" of the heart, and dependent on chronic myocarditis or obliterative endarteritis of branches of the coronary artery, and often associated with hypertrophy, are very difficult of diagnosis and offer no other indications for treatment than such symptoms of cardiac failure, and circulatory disturbances as may accompany them, and as are also common to *dilatation* and to non-compensated valvular lesions; and these we have already described, and their appropriate treatment has been pointed out.

There, are, however, two conditions of the myocardium which may now claim a brief consideration from a therapeutic point of view, viz. **"fatty degeneration,"** properly so-called, and the **"fatty overgrowth,"** which so commonly accompanies excessive obesity. The former of these is a true granular and fatty degeneration of the cardiac muscle, which becomes pale and flabby. It arises in connection with defective nutrition, and may therefore be merely a senile change; it occurs also in cachectic and wasting diseases, and after prolonged attacks of the infective fevers. It may be the result of acute and chronic anæmia, especially of that form which is termed *pernicious;* it is a well-known consequence of phosphorus poisoning; it sometimes follows attacks of pericarditis; it may be dependent on disease of the coronary arteries; and it is a common feature in the degenerative changes of chronic hypertrophy.

The symptoms of fatty degeneration are those common to cardiac failure from any cause; the diagnosis of this condition is therefore difficult, especially if a systolic apex murmur should happen to be present. The existence of very marked signs of cardiac failure without any history of pre-existing valvular disease, or exposure to the ordinary causes of endocarditis, may excite a well-grounded suspicion of the existence of fatty degeneration.

The break-down is also often comparatively sudden; dyspnœa is complained of on the slightest exertion, with sighing and a sense of oppression in the chest. There is great muscular debility and incapacity for any exertion physical or mental. Irritability of temper and other mental disturbances are probably dependent on an insufficient blood supply to the brain. The patient often feels cold and depressed, and his pulse is found to be slow, feeble, irregular, and intermittent; it may sink as low as 40 or 30 in the minute. The cardiac impulse is feeble, perhaps imperceptible, the sound weak, and the action arhythmic; a systolic apex murmur may or may not be present. Sleep is often disturbed by distressing attacks of cardiac asthma, so that the patient fears to fall asleep. *Anginal* attacks occur in some cases. Œdema of the lower extremities is of grave import. These are the symptoms our **treatment** must be directed to relieving. In all such cases we should begin by giving *digitalis;* the less advanced the degeneration the more likely is it to be useful, and it can do no harm; but if we find no response to its use, in the shape of improved cardiac action, it is of no avail persisting with it. We should not, however, give digitalis when the pulse is very slow and irregular, with a tendency to syncope.

Absolute rest in the recumbent position is of prime importance, and, at regular intervals, a proper amount of light, easily-digested, nourishing food must be given. If the patient responds readily to small amounts of alcoholic stimulant, such as a few teaspoonfuls of brandy or whisky in a little hot milk, there is no good reason for withholding it, although we must be especially careful not to yield to any morbid craving in this direction. Some diffusible stimulant will certainly be frequently necessary to remove the sense of faintness or threatened syncope, and the distressing feeling of oppression at the chest, such as the following:—

℞ Spr. ætheris comp.	āā 4 drams.
Spr. ammoniæ aromat. ...	
Tinct. nucis vomicæ	2 ,,
Tinct. lavandulæ comp.	4 ,,
Aquæ carui	ad 8 oz.

M. f. mist. One or two tablespoonfuls, with a tablespoonful of water, when necessary.

Nux vomica or *strychnine* is a very useful medicine in these cases, and it may sometimes be combined with coca with good effect, as in the following:

℞ Liq. strychninæ	32 minims.
Ext. cocæ liquid.	4 drams.
Spir. chloroformi	2 ,,
Aquæ cinnam. ... ... ad	8 oz.

M. f. mist. Two tablespoonfuls three times a day.

If, perchance, there should be anginal attacks attended with a hard, firm pulse (which will rarely be found), a nitro-glycerine tablet containing the equivalent of one minim of a 1 per cent. solution may be given, and its effect noted.

Being much in the open air, the fresh air of the country, in order to promote as complete oxygenation of blood as possible, is extremely desirable; a hammock, or some suitable couch for reclining out of doors, is needed in these cases, and when the patient is strong enough to travel, much good will often result from passing the winter in a warm, sunny climate.

Preparations of iron are useful in the less advanced cases. We may combine the citrate of iron and ammonia in 10-grain doses with ½ a dram of aromatic spirits of ammonia and an ounce of infusion of calumba, and give it three times daily: or we may give 10 grains of the citrate of iron and quinine and 3 to 5 minims of liquor strychninæ in ½ an ounce of chloroform water in the same way; or we may give a pill of a grain of valerianate of iron and a grain of extract of nux vomica after meals three times a day.

What we have before said about the use of aperients in cases of cardiac failure must still be borne in mind, and the regulation of the bowels and the digestive functions generally must be duly seen to. Unless there is any dropsy it is best, however, not to produce watery motions, and a dinner pill of aloes, rhubarb, and ipecacuanha will be most suitable.

Restlessness and insomnia are often distressing symptoms in these cases, and although it is, for many reasons, undesirable to give opium, we shall occasionally be obliged to have recourse to it. We should first, however, try the effect of bromide of potassium: bromide in 15 to 20-grain doses, alone, or combined with 1 or 2 drams of tincture of hop, or 20 to 30 minims of compound spirits of ether. If these fail we may try hypnal and grain doses of codein; and if we are obliged to give opium or morphine we should begin by giving 1/6 of a grain of sulphate of morphine with 1/2 a dram of aromatic spirit of ammonia in an ounce of chloroform water, and if this dose agrees well and causes no faintness but seems, as will sometimes be the case, to improve the cardiac action, it may be repeated after 4 or 5 hours. We disapprove of the hypodermic use of morphine in these cases as it will, if administered in this way, sometimes exercise a seriously depressing effect on the heart.

Fatty overgrowth is associated with a general tendency to the deposition of fat, and is often encountered in the obese. It may simply amount to an excess of the normal quantity of fat underlying the pericardium. In other cases the fatty deposit penetrates into the muscular substance of the heart, and is found as an infiltration between the muscular fasciculi.

In extreme cases of this kind the heart becomes enveloped in a thick covering of fat, and on section fat is found freely interspersed amongst the muscular fibres, and this fatty infiltration may extend to the internal partitions. Some of the muscular fibres are found atrophied, and others in a state of fatty degeneration. It follows naturally that the walls of the heart become flabby, and its cavities dilated, and symptoms of cardiac failure appear, and are more or less severe according to the extent of the fatty overgrowth or degeneration, and the dilatation thus induced.

The chief **causes** of this condition are indolent and luxurious habits of life, over-feeding, over-indulgence in alcoholic beverages, especially in beer, together with insufficient muscular exercise.

The **treatment** appropriate to these cases will depend upon the stage the disease has reached when the patient comes under observation. In the later stages the symptoms of cardiac weakness and failure which present themselves will require precisely the same kind of management as has just been described. In the earlier stages, where it may be presumed there is simply an excess of fatty deposit on the surface of the heart, and no serious amount of infiltration of the heart substance or atrophy of the muscular fibres, much may be done, with the hearty co-operation of the patient, to ameliorate his condition and check the tendency to fatty degeneration. In the first place all excesses in eating and drinking must be at once suppressed. No alcoholic beverages must be permitted, or at most a little weak claret or hock diluted with water. Drinking at meals must be forbidden, and such fluid as is needed must be drunk either half an hour before a meal or an hour or two after. This will, at once, diminish the amount of food taken at each meal, and ensure its more complete mastication. A glass of hot water sipped an hour before a meal and at bed-time, to which a slice of lemon may be added for flavour, will be useful both in promoting digestion, in flushing away waste products, in allaying thirst, and in promoting the secretion of bile and the regular action of the bowels. As in the treatment of obesity,* carbohydrates and hydrocarbons should be as far as possible eliminated from the daily dietary and nitrogenous food taken in its stead. The lean of butcher's meat, chicken, game, and white fish, preferably served in mince or jelly and lightly cooked may be freely taken. Green vegetables and acid and ripe fruits in moderation may be permitted. In the early stages of this affection much benefit often results from one or more courses of mineral waters and baths at Marienbad, Carlsbad, Kissingen, Buxton, or Harrogate.

Moderate regular exercise, walking or riding, should also be insisted on.

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* For which, see the author's "Food in Health and Disease."

We may here take occasion to refer to what is known as Oertel's cure for cardiac diseases, and especially for this form of disease. We have little to say in its commendation; what is good in it was already well known and practised, and what was new in it, and over-elaborated into a system of treatment, has already fallen into discredit and disuse even in the country in which it originated, and which is unreasonably devoted to "*systems* of cure." What was new in it was the systematised *hill-climbing*, a method of treatment at first eagerly seized at, as affording another attraction, and another source of profit, to the many health-resorts in mountainous districts in Germany and Switzerland, while the possession of a "Terrain Kur" was added to their other claims to the patronage of invalids. The crude and ill-digested idea of enforcing additional exercise on a never-resting, hollow muscle like the heart with the view of strengthening it, when feeble, as if it were an ordinary *voluntary* muscle, should have roused the opposition of intelligent physicians by reason, not only of its absurdity, but of the obvious danger attending its application; and it may be said, to the credit of the medical profession in England, that it never at any time gained support there. But in some parts of Germany, where it was rashly applied to the treatment of some forms of valvular disease, serious and fatal consequences, amongst persons in distinguished positions, were not slow in presenting themselves, and except in one or two districts, this method is already set aside. The painted posts and indications are indeed still to be seen in many a picturesque spot where the "Terrain Kur" was established. The paths and indications are there, but the invalids are not! As we have already said, what was good in the system was in no sense new. Regular tranquil exercise—when the heart is really weak, preferably on *level* ground, a life passed much in the open air, free action of the skin promoted by baths and frictions, *massage* when there is any difficulty in obtaining other exercise for the muscles, a suitably regulated diet, with limitation of liquid: these are the measures best calculated to relieve and cure this form of cardiac affection.

ADDITIONAL FORMULÆ.

In hypertrophy, with aortic regurgitation.

℞ Tinct. aconiti, 1 minim.
Tinct. veratri virid., 3 min.
Tinct. zingib., 7 minims.
Aquæ ad 1 oz.

M. f. haust. To be taken three or four times a day. (*Da Costa.*)

Another.

℞ Tinct. aconiti, 20 minims.
Potassii bromidi, 120 grains.
Spr. ætheris nitrosi, 5 drams.
Aquæ camphoræ ad 3 oz.

M. f. mist. A teaspoonful every two hours. (*Whitla.*)

Powders for cardiac hypertrophy.

℞ Asparagin, 10 grains.
Potassii bromidi, 2 drams.
Sacchari alb., 3 drams.

M. et divide in pulv. 10. One thrice daily. (*Matlack.*)

Pills for cardiac dilatation.

℞ Pulv. digitalis, 5 grains.
Extr. belladonnæ, 1 grain.
Ferri redacti, 40 grains.

M. et divide in pulv. 20. One thrice daily. (*Da Costa.*)

Mixture for simple dilatation.

℞ Extr. ergotæ fluid., 3½ oz.
Tinct. digitalis, ½ oz.

M. f. mist. A teaspoonful three times a day in water. (*Bartholow.*)

In cardiac asthenia and dilatation.

℞ Pulv. digitalis, 3 grains.
Quininæ sulph., 15 grains.
Pulv. rhei, 15 grains.
Sodii bicarb., 15 grains.

M. et divide in pulv. 10. One twice a day. (*Schnitzler.*)

Pills for cardiac dilatation.

℞ Ferri lactatis, ½ dram.
Pulv. digitalis, 5 grains.

M. et f. pil. 20. One three times a day. (*Da Costa.*)

In fatty degeneration.

℞ Spiritus ætheris, 1 oz..
Tinct. belladonnæ, 2 drams.
Spir. ammon. arom., 1 oz.
Tinct. zingiberis, 6 drams.

M. f. mist. A teaspoonful in a wineglassful of water when dyspnœa is severe. (*Whitla.*)

For cardiac asthma.

℞ Tinct. digitalis, 1½ dram.
Tinct. lobeliæ, 1½ dram.
Aquæ laurocerasi, 3 drams.

M. Five drops every hour. (*Bamberger.*)

For cardiac dyspnœa.

℞ Potassii iodidi, 20 to 30 grains.
Chloral hydrate, 30 to 60 grains.
Mucilaginis acaciæ, 4 drams.
Syrupi flor. aurant., 4 drams.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every two hours. (*G. Sée.*)

Hypodermic injection of camphor in cardiac disease when digitalis fails. (It sometimes renews the effect of digitalis.)

℞ Camphoræ, 1 part.
Ol. olivæ, 9 parts.

M. Fifteen drops for a dose.

(*Alexander.*)

Hypodermic injection of caffeine and morphine.

(The caffeine is added for the purpose of avoiding the depressing effect of the morphine.)

℞ Caffeinæ, $\frac{1}{8}$ grain.
Morphinæ sulph., $\frac{1}{8}$ grain.
Atropinæ sulph., $\frac{1}{100}$ grain.
Aquæ camphoræ, 20 minims.

M. f. injectio. (*Cochrane.*)

(It would be better to give $\frac{1}{2}$ a grain or a grain of caffeine, which might be dissolved by the addition of a grain of sodium benzoate.)

CHAPTER V.

THE TREATMENT OF CARDIAC NEUROSES—PALPITATION —CARDIAC PAIN—ANGINA PECTORIS.

Palpitation—Its Nature and Causes—"Irritable Heart"—"Paroxysmal tachycardia"—"Bradycardia"—*Treatment* of Palpitation—Open-air Life—Regimen—Diet—Cardiac and other Tonics—Bromides for Sleeplessness—Antacids—Aperients—Hysterical Cases.

Cardiac Pain—"Sub-mammary Pain"—Its Nature—Value of Local Counter-irritation—Digital Exploration of præcordial Region—Cases of Cardiac Pain—Relation of these to Cases of true Angina—Aortic Strain.

Angina Pectoris—Symptoms—Causes—Classification—Objections to the *vasomotor* hypothesis—*Causal Indications for Treatment*—Hygienic Treatment—Treatment of Dyspeptic States—Avoidance of *Toxic* Agents—Removal of Gouty and other Blood Contamination—Importance of Elimination—*Medicinal* Measures in the *Intervals*—In the *Paroxysms.* Additional Formulæ.

We must next consider the treatment of those affections of the heart which are regarded, mainly, as disorders of cardiac *innervation*, and which may occur independently of the existence of structural disease. It must, however, be obvious that the presence of structural disease is no impediment to the manifestation of disorders of cardiac innervation, and that although we are now about to consider these affections as distinct and independent morbid states, they do, very commonly, co-exist with structural disease of the valves and walls of the heart, and may be more or less closely connected therewith.

PALPITATION.

Palpitation may be described as a consciousness of the heart beat; an "irregular or forcible action of the heart *perceptible* to the individual."

The heart beat is usually in health unconscious, except that in most persons the heart beat may be rendered conscious by the assumption of certain positions. There are many healthy individuals who on lying down at night in bed on the *left* side become conscious of the heart beat. The explanation of this would seem to be that the heart suffers more displacement when one lies on the left side than on the right.

But palpitation as a morbid condition is more commonly referrible to some disturbance of cardiac innervation. Palpitation usually means that the heart beat is not only conscious, but that it is actually increased in force and rapidity. Cases are, however, encountered, though rarely, in which the palpitation is wholly *subjective*, and although the patient may complain of the most distressing feelings of beating and throbbing at the heart, on physical examination the heart is found to be acting with perfect regularity. Such a condition is doubtless one of cardiac hyperæsthesia, and we have found, in such cases, that pressure made immediately over the cardiac apex will elicit an expression of pain, which will not be felt by making the same kind of pressure over adjacent parts of the surface of the chest.

But commonly the complaint of palpitation is accompanied by increased rapidity and force of the cardiac contractions; the patient's body may sometimes be seen to shake with the force of the heart beat, and the coverings of the bed to be lifted with each impulse, at the same time the carotids throb violently. There is a sense of oppression and discomfort in the cardiac region, a feeling of fulness in the head, of giddiness or faintness and even an apprehension of impending death.

The **causes** of this condition are various. It would certainly seem to be frequently *central*, and dependent primarily on some disturbance of the emotional centres; in some cases it would seem to depend on a disorder of the *vaso-motor* nerves; and in others on *reflex* irritation of the cardiac nerves.

Emotional disturbances of any kind will induce palpitation in many persons, but especially in the feeble and excitable, so that it is much more common in females than in males. Anæmia and chlorosis, and all debilitating influences, certainly predispose to, if they do not actually cause, palpitation.

Excessive mental labour, together with sleeplessness, will give rise to palpitation. But it must be remembered that palpitation is itself a cause of sleeplessness by the quickened circulation through the brain it produces, as well as the discomfort attending it. The palpitations observed in youth of both sexes, about the age of puberty, are frequently associated with hysteria, sexual excitement, or masturbation.

Hyperlactation has been mentioned as a cause. It is especially prone to accompany neurasthenic states, disorders of menstruation, and the troubles of the climacteric period.

A combination of mental excitement and excessive muscular effort seems to have been the cause of the "irritable heart" observed by Da Costa amongst the young soldiers in the American Civil War. The chief symptoms were palpitation with greatly quickened pulse, dyspnœa, and more or less cardiac pain.

Dyspeptic states and flatulence are frequent causes of palpitation. In such instances, not only may there be reflex irritation of the cardiac nerves from offending ingesta, but when there is over-distension of the stomach and intestines by gas or by excess of food or drink, as in great eaters and drinkers, then there is the further disturbing influence of upward displacement of the heart by the pressure of the distended stomach and intestines upon it. The palpitation associated with constipation is often of this kind, although it has been regarded as reflex and referred to the irritation of the abdominal nerves by scybala.

Disease of the pelvic viscera and especially uterine displacements and inflammation are frequent causes of palpitation.

Whatever causes diminished blood-pressure by dilating the small arteries and lessening the obstruction the heart normally has to overcome may excite palpitation, as alcoholic intoxication, exposure to excessive heat in hot baths, Turkish baths, etc.

The cardiac nerves, in certain persons, are prone to be disturbed by certain substances in common use, such as tea (especially certain kinds, as *green* tea), coffee, tobacco, etc. These sometimes disturb the cardiac rhythm and produce irregularity and intermission together with vague, uncomfortable feelings in the region of the heart, without causing actual palpitation. And it is generally their excessive or prolonged use, not their moderate or occasional use, that causes those disturbances of cardiac innervation.

It has been stated that the occurrence of palpitation about the period of puberty is often due to the heart not developing in proportion to the rest of the body. We have already said that it is a common incident of organic heart disease, and it forms one of the most striking symptoms, as we shall see, in that singular affection, "*exophthalmic goitre.*"

Tachycardia is the name that has been invented to distinguish the "*rapid heart*" from the heart affected by palpitation. It is used to express a fact which is common enough, viz. that some persons habitually have a rapid pulse rate just as others have a slow pulse rate. *Paroxysmal tachycardia* is used to express the fact that certain persons suffer from rapid action of the heart occurring in paroxysms, generally associated with palpitation, and not infrequently accompanied with dyspnœa and cardiac pain. The dyspnœa may be so severe as to suggest an attack of asthma. This affection would appear to be frequently dependent on the same causes as palpitation, but it has also been found connected with structural lesions of the medulla and vagi (tumour or clot). One of the most remarkable instances we ever saw, in which the pulse rate was 200 to 230, was associated with utero-gestation.

An unusual *slowness* of the pulse, which is the normal condition in some individuals,* and is said to occur paroxysmally in others, has received the denomination of *brachycardia* or *bradycardia*. As a morbid phenomenon it is found in states of exhaustion from protracted acute and other debilitating diseases; in certain chronic dyspeptic states, and jaundice; in cardiac degeneration; occasionally in pulmonary emphysema; in uræmia and other toxhæmic states; in certain diseases of the nervous system, apoplexy, tumours, sunstroke, etc., etc.

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* Napoleon is said to have had a pulse-rate of 40, and Talleyrand to have always had a very slow and intermittent pulse.

The **treatment** of these disturbed states of cardiac innervation, and especially of palpitation, must now be considered.

The first and most important indication is to endeavour to seek out the cause of this disturbance, and if possible to remove it. When it is clearly dependent on emotional excitement and disordered mental states we must take measures to subdue them, and especially we must reassure the patient, and try to convince him that the symptom is not a dangerous one; when it is associated with debility we must prescribe appropriate tonic remedies. When due to sexual aberrations or hysterical conditions we must frankly explain the cause of the malady and point out the only sure method of cure. When produced by excess of work, physical or mental, we must insist on the remedial effect of rest. When accompanying disorders of the female pelvic organs those must be taken in hand and properly treated. If dependent on dyspeptic states, flatulent distension, and constipation, dietetic and medicinal measures must be directed to their removal. When clearly traceable to the toxic influence of some habit, such as the excessive use of tea, coffee, or tobacco, these must be forbidden. When it is connected with some organic lesion of the heart, the remedies already set forth as appropriate to them must be applied. And finally, when it is a symptom associated with incurable lesion of the nervous system, we must have recourse to certain sedative agents which may at least afford temporary relief.

Nothing is perhaps more generally useful and applicable to many forms of palpitation than regulated exercise in, and *free exposure* to, the open air. In debilitated states, when the cardiac muscle is weak, much walking exercise is undesirable, but gentle driving exercise is most useful, and sitting or reclining in the open air has both a tonic and sedative influence. Bodily restlessness, which in some persons accompanies mental disturbance, must, however, be kept under control, and 9 or 10 hours' rest in bed should be insisted upon. In many nervous cases judicious hydrotherapeutic treatment, such as warm affusion applied generally, followed by cold sprinkling, especially along the spine, which may in time be altered to a brief cold douche, succeeded by brisk friction of the skin, will be found most beneficial.

In these nervous patients nothing is more certainly opposed to successful treatment of their dyspeptic troubles than the "little and often" method of feeding by which they attempt to still their abnormal "*cravings.*" We should, therefore, insist on due and sufficient intervals between meals; if we have evidences of a slow and feeble digestion we should allow at least 5, and often 6 hours, to intervene between successive meals. Nothing whatever should be permitted between meals beyond a cup of hot water with a few teaspoonfuls of milk, or a small cup of light broth or *consommé.* Tea, coffee, tobacco, must be prohibited, but small quantities of sound wine and pure spirit, well diluted with water, may be permitted at meal times. The meals themselves should consist of a moderate amount of easily digestible and nourishing food, chiefly animal, previously minced or pounded, if any masticatory carelessness or defect exists, and a small amount of vegetable *purées.* The fluid at meals should be strictly limited in quantity.

It may be necessary in neurasthenic cases, with anorexia and great inanition, to apply the Weir Mitchell system rigorously.*

* See the author's "Food in Health and Disease," p. 488.

In cases associated with anæmia or exhaustion, especially after acute illnesses, much benefit will follow the administration of some suitable form of iron combined with strychnine. Strychnine and nux vomica act better as cardiac tonics in many of these cases than digitalis or strophanthus; we should always, however, *try* the effect of digitalis in small doses, as it sometimes acts remarkably well, but if it does not quickly produce a good effect we should relinquish its use.

The following formulæ are useful :—

℞	Ferri et quininæ citratis ...	40 to 80 grains.
	Liq. strychninæ	40 minims.
	Spr. chloroformi	120 ,,
	Acidi hydrobromici	80 ,,
	Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls twice or three times a day an hour before food.

Or this :

℞	Ferri et ammonii citratis	80 grains.
	Tinct. nucis vomicæ	2 drams.
	Sodii bromidi	80 grains.
	Spr. ammoniæ aromat.	4 drams.
	Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls three times a day.

In more distinctly neurotic cases valerianate of zinc and iron will be found very valuable. A grain of either of these made into a pill with a grain of extract of nux vomica may be ordered twice a day an hour after food. It may often be desirable, when sleeplessness accompanies palpitation, to give a full dose of bromide at night; 15 to 30 grains of sodium or potassium bromide in an ounce and a half of chloroform water should be ordered at bed-time: it is generally advisable at the same time to recommend the patient to sleep with his head and shoulders well raised on pillows, so as to prevent the abdominal contents from pressing on the cardiac region, and to allow of nothing but a little soup or other light food for some hours before bed-time.

When palpitation accompanies organic disease of the heart, or is associated with cardiac hyperæsthesia, as evidenced by tenderness on pressure over the cardiac apex, a plaster of belladonna or opium applied over the præcordia is of great use.

In a troublesome case of paroxysmal palpitation accompanying aortic and mitral disease in a young woman, we found painting strong iodine paint along the course of the pneumogastric nerves in the neck was quickly followed by relief of the palpitation and reduction of the pulse rate from 120 to 80.

When symptoms of chronic gastric catarrh are associated with palpitation, a gastric sedative and antacid should be prescribed, such as

℞	Bismuthi carbonatis	10 grains.
	Magnesii carbonatis	5 ,,
	Sodii bicarb.	10 ,,
	Aquæ laurocerasi	1 dram.
	Aquæ caryophyll.	ad 1 oz.

M. f. haust. To be taken an hour before food twice a day.

Suitable aperients should also be ordered in case of constipation, and in obstinate cases with retained scybala, enemata of soap and water, with a few tablespoonfuls of olive oil added, should be administered with a long tube. In hysterical cases a combination of valerian and bromides often proves useful—20 grains of sodium or ammonium bromide with a dram of the ammoniated tincture of valerian and an ounce and a half of chloroform water may be given for a dose.

Various expedients have been recommended for the treatment of the paroxysmal forms, such as an ice-bag over the cardiac region, a tablespoonful of brandy in a little water (dangerous on account of the fear of exciting a craving for alcohol), a mixture of sal volatile and compound spirits of ether with tinctures of lavender, henbane, cannabis indica, etc.

For paroxysmal "heart-hurry" the bromides have been found useful; an ice-bag or Leiter's tubes over the heart, and the application of the continuous galvanic current along the course of the great nerve trunks in the neck have also been recommended. This condition is, however, not very amenable to medical treatment. The *slow pulse*, when constitutional, needs no treatment, but individuals with this peculiarity require more active stimulation and a more supporting *régime* when attacked by any acute illness than others. When it is a symptom of cardiac exhaustion or degeneration it needs the same supporting and tonic remedies as we have already fully described.

CARDIAC PAIN.

Before we pass on to consider that grave cardiac affection known as *angina pectoris*, it will be well to refer to other less serious forms of cardiac pain which we encounter. All experienced practitioners are aware of the fact that when a patient complains of "pain at the heart" it is an expression frequently used very vaguely, and simply refers to the existence of pain about the anterior part of the chest on the left side, which may not be of cardiac origin, but dependent on rheumatism, or intercostal neuralgia, or costal periostitis, or acute or chronic pleuritis, or some flatulent or dyspeptic state. There is, however, a particular form of pain frequently complained of by young chlorotic women, who are at the same time the subjects of menstrual irregularities, and which is termed **"sub-mammary pain."** It is frequently associated with ovarian irritation and tenderness, especially on pressure over the left ovary. We have had occasion to believe that this sub-mammary pain is, in many cases, really cardiac. An attentive exploration of the region of the cardiac apex with the tip of the finger will often reveal the fact that this is the precise seat of the pain complained of, and firm pressure here with the finger-tip will greatly aggravate it.* With such patients you may press with moderate firmness on various parts of the surface of the chest with the tip of the finger without provoking any complaint of pain, but the instant the pressure falls over the cardiac apex the patient starts back with a decided expression of suffering. Dr. Balfour, in the first edition of his valuable lectures on "Diseases of the Heart," spoke of this "sub-mammary pain" as "wholly external," but he modified this view in his second edition, and says: "In most the pain is truly cardiac in character." But it sometimes occurs in its most obstinate forms in young women who are not anæmic, but who suffer from ovarian irritation. In these cases a peculiar hyperæsthesia* of the cardiac substance seems to be set up, possibly of a reflex nature. When sub-mammary pain is associated with anæmia it will disappear as the anæmia disappears, and will require the same treatment; but when it occurs in robust, florid girls, with sexual irritability, we have found the repeated application of small flying blisters over the cardiac apex and over the painful ovary (almost always the left) the most effective mode of treatment.

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* See a clinical lecture by the author, on "Pain at the Heart and Palpitation," in the *Lancet* of Aug. 12, 1882.

Professor Peter has pointed out that in some of these conditions of cardiac pain certain distinctly painful spots may be made out on exploring the anterior surface of the chest with the tip of the finger. If there is a hyperæsthetic state of the myocardium, pain on pressure will often be found to exist in the fourth and fifth left intercostal spaces, near the sternum, and also over the cardiac apex. In cases of "tobacco-heart" in middle-aged men, Peter has noticed that pressure over a very limited point in the third left intercostal space, near the sternum, will give rise to acute pain, and he thinks this pain corresponds with the auriculo-ventricular groove, and that it is probably due to a morbid condition of the ganglion of Remak, caused by tobacco. *Conscious* cardiac intermissions accompany this state of the tobacco-heart, as they also do some cases of coffee intoxication. The pain, on pressure, which is found to exist in some cases of disease of the aorta and its valves, in the second left interspace close to the sternum, and over the sternum itself at the same level, is, according to Peter, not due to the lesion of the aorta itself, but to a neuritis propagated from the diseased aortic tissues to the nerves lying on it. Neuritis and neuralgia of the cardiac plexus is revealed by pain on pressure with the tip of the finger (attacks of angina have been provoked by *too strong* exploratory pressure) either in the third, second, or first left intercostal space near the sternum, and especially the second, a few lines from the sternum. In these cases there is some tenderness on pressure over the vagus, just at the root of the neck, inside the anterior border of the sternomastoid.

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* Harvey had the opportunity of making some observations on the Duke of Montgomery, whose heart was partially exposed after the healing of a severe wound of the chest, and he convinced himself that the heart in a healthy state was entirely wanting in sensibility.

In connection with the co-existence of valvular disease it is certainly noteworthy how much less frequently we have complaint of cardiac pain in mitral than in aortic cases, although cardiac *discomfort*, not amounting to severe pain, is common enough in mitral cases. It has been suggested that the reason of this probably is, that in aortic disease there is often a chronic inflammation of the coats of the aorta, which extends to the contiguous nerves of the cardiac plexus.

The annexed diagram (Fig. 13) shows the situation of spots of well-marked tenderness on pressure in a case under our care of aortic valve disease, together with signs of aortic dilatation. The patient (who had had four attacks of acute rheumatism) complained of *pain at the heart* shooting through the left breast to the back, and also of sudden pains across the chest, causing him to stop short when walking. He also had some dyspnœa, cough, and blood-stained expectoration. He was pale and emaciated. Pulse 104, small. This patient was greatly benefited by the following treatment, and the pulse was reduced to 88 : flying blisters, the size of a florin, over the upper sternal and præ-aortic region, 5 minims of tincture of digitalis, 10 grains of ammonio-citrate of iron, and an ounce of infusion of calumba, thrice daily.

In another case of aortic regurgitation in a lady 32 years of age, who had been under our observation for some years, she at one period, after a shock owing to the death of a sister, complained of much nervous distress and sleeplessness, but especially of *pain in the cardiac region*, shooting down both arms to the elbows, and aggravated by the least exertion, also of palpitation, pulse 120. There was in this case distinctly one, but only one, painful spot on pressure with the tip of the finger over the front of the chest, and this was at the sternal end of the second left interspace. She was greatly benefited, and this tender spot disappeared, and the pulse came down from 120 to 80, by the same treatment as that just described, viz. counter-irritation over the præaortic region by means of flying blisters and a combination of digitalis and iron.

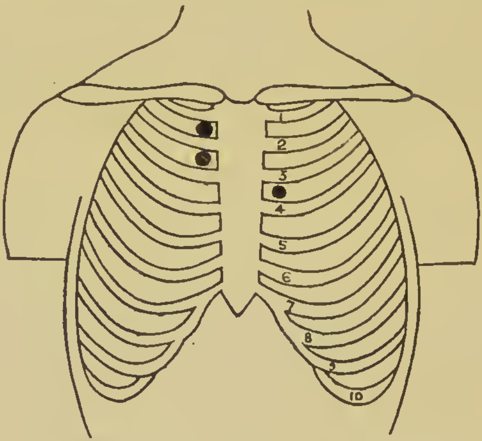

Fig. 13.—Painful Spots in a case of Aortic Regurgitation.

In another aortic case (obstructive and regurgitant murmurs), a young man 22 years of age, under our care in King's College Hospital,* complaint of *cardiac*

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* This case was carefully noted by Dr. Silk, the then house physician.

pain was a most notable symptom. The pain, commencing in the cardiac region, would shoot down the left arm, and was at times very severe and prevented him from sleeping, and it was much aggravated by exertion. Countenance pale and anxious, much cardiac hypertrophy, apex beat in seventh interspace 1½ inch outside nipple line. Much general arterial thickening. The exploration of the chest and neck revealed several points where there was great tenderness on pressure. They are shown in the accompanying diagram (Fig. 14).

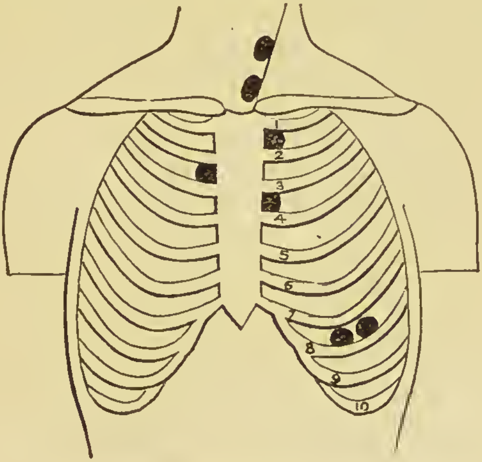

Fig. 14.—Painful Spots in a case of Aortic Disease.

Two points close together over the diffused apex beat, other points in the first and third left interspaces close to sternum, and another in the second right interspace close to sternum, and two points over the course of the vagus in the neck, just in front of the anterior border of the sterno-mastoid. This patient was greatly relieved by the following treatment: rest in bed, a diet composed largely of milk, small flying blisters over the base of the heart, small doses of digitalis with ammonio-citrate of iron, and sometimes with ether and ammonia, and occasionally, when the cardiac pain was very severe, hypodermic injections of morphine. In this case there probably existed not only neuritis of some of the nerves of the cardiac plexus, but also some chronic myocarditis and more or less degeneration of the cardiac muscle; hence the pain at the apex, where the degeneration is usually most advanced.

In another aortic case * somewhat resembling the foregoing, painful points were found on pressure over the vagus in the neck, as well as in the first and second left interspaces close to the sternum, and relief was at first experienced from counter-irritation; but subsequently the patient was attacked at night with paroxysms of pain and dyspnœa of an anginal character, which were relieved by inhalation of nitrite of amyl.

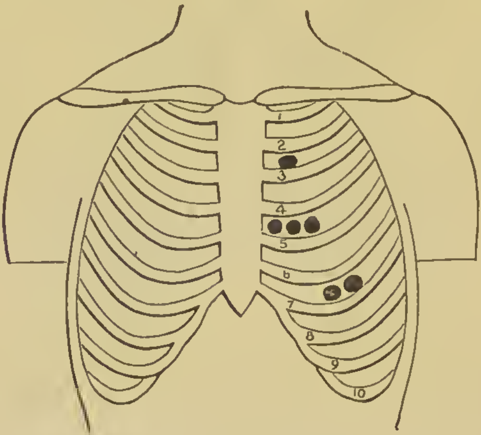

Fig. 15.—Painful Spots in a case of Mitral Disease.

The annexed diagram (Fig. 15) shows the painful points noted in a case of mitral stenosis, with incompetence, in a female 32 years of age, who complained greatly of severe "pain at the heart," extending into the back between the shoulders. In this case, owing to the co-existence of fibroid disease with retraction of the left lung, the surface of the heart was largely uncovered. Cardiac pulsation was visible in all the

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* Carefully observed and noted by my former clinical clerk, Mr. C. G. Hodgson, of Brighton.

situations of the painful spots, and doubtless some chronic inflammation of the cardiac muscle had conferred upon it a morbid sensibility. Counter-irritation in the form of small flying blisters, rest in bed, occasional frictions with the mixed belladonna and chloroform liniments, small doses of digitalis and iron, led to the relief of pain, to regulation of the cardiac action, and to great improvement in the general health.

The next diagram (Fig. 16) shows painful points

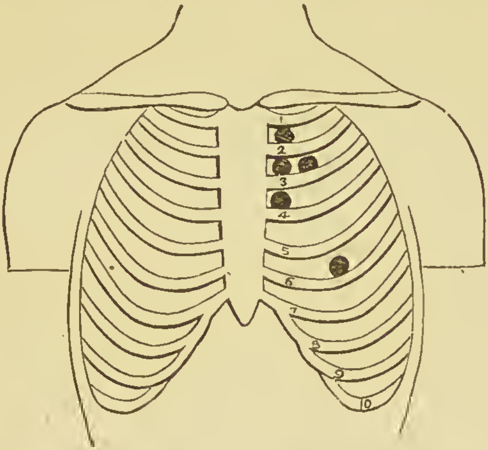

Fig. 16.—Painful Spots in a case of Functional Cardiac Disease

observed in a case in which the cardiac disturbance was purely functional. A housemaid, 25 years of age, accustomed to carry heavy trays upstairs, complained of "pains at the heart darting through the chest" and palpitation. She could not move without distressing palpitation, accompanied with dyspnœa and "throbbing at the heart." The pain was worse after food and on attempting to mount stairs. She suffered also from dysmenorrhœa, constipation, and flatulence. She had been in the habit of drinking a *quantity of tea* three times a day. Her cheeks were flushed, but her lips and gums were pale and bloodless. The heart's impulse was greatly exaggerated, and the large vessels at the root of the neck pulsated strongly. There were no murmurs. On exploring the cardiac sensibility the following painful points could be made out—one over the apex and others at the sternal end of the first, second, and third left interspaces. She was ordered to abstain from tea, and she was given eight minims of tincture of digitalis, with ammonio-citrate of iron and infusion of calumba, thrice daily, and a daily dinner pill of aloes and nux vomica. She rapidly improved, the painful spots became less sensitive, and then disappeared; the pulse was reduced from 120 to 84, and in a month she was quite well, and the cardiac pain and sensibility had disappeared. This was a case of disturbed cardiac innervation with hyperæsthesia, induced by excessive tea-drinking, and augmented by the severe muscular efforts she had to perform.

The affinity between these minor attacks of cardiac pain and the graver cases of angina pectoris is illustrated by another case, a housemaid also aged 21, who complained of severe pain in the cardiac region, brought on by carrying heavy trays upstairs. The pain came on *suddenly* two or three times a day, and extended down the left arm, which, she said, "went stone cold." She suffered also from loss of flesh and headaches. Pulse 100, feeble. No murmurs. There was marked tenderness on pressure in the third left interspace, extending from the sternum outwards for three-quarters of an inch. There was *distinct localisation* of *extreme tenderness* over this spot. There was also a tender point, but much less sensitive, over the apex. She was first treated with iron and calumba thrice daily, and chloroform and belladonna liniment locally. This, after a month, had given but little relief. Five grains of potassium bromide were then added to each dose of the mixture, and a flying blister, the size of a florin, was ordered to be applied for two hours at a time over contiguous spots at and near the sternal end of the third left interspace. Under this treatment the tender points disappeared, and the pain in the cardiac region and left arm disappeared also. This last case was doubtless one of true cardialgia, probably induced by over-fatigue and cardiac strain, and it had many points in common with angina pectoris. It is certainly noteworthy how in this and other like cases the cardiac tenderness seems to be specially localised about the sternal end of the second or third left interspace, and how speedily the symptoms were relieved by counter-irritation over this spot. Another case which came under observation before we had adopted this method of exploring the cardiac sensibility is of interest as having apparently the same causation as the preceding. She was a waitress, 29 years of age, and had in her occupation to carry heavy trays upstairs. The attacks of cardiac pain were more distinctly paroxysmal and nearer still in character to those of true angina, and the case terminated fatally after only a few months' illness.

The causal relation between these last three cases is obvious. They were all young women in fairly good health, with no antecedents leading to cardiac disease, save that they were all engaged in the same occupation, and all complained of the effects of carrying heavy trays upstairs. In the first and slightest of these cases the cardiac disturbance was undoubtedly aggravated by the abuse of tea. In all three, and especially in the last two, the symptoms complained of bore a striking likeness to one another. In neither of them, when first seen, was there any definite cardiac murmur. May we not trace the varying effects of cardiac or vascular strain in each of them? As we have already pointed out, in severe and sustained muscular efforts there is increased action of the cardiac muscle on the one hand, and increased resistance at the periphery from muscular compression of the arterioles and capillaries on the other. If the cardiac muscle is ill-nourished and weak from co-existing anæmia, then the ventricular wall may yield and become dilated, and we may get cardiac palpitation and pain from fatigue, malnutrition, and hyperæsthesia of the cardiac muscle.

But if the tone of the cardiac muscle is fairly good and its contractions sustained and vigorous, then we should expect the strain to be chiefly felt at the commencement of the aorta, for in sustained muscular efforts it has to bear a twofold distending influence : it has to bear the augmented impetus of the ventricular outflow, increased both in force and frequency, as well as the increased resistance in the peripheral vessels. In these circumstances it is not remarkable that it should become the seat of chronic inflammatory changes, which may extend to and involve the nerves of the cardiac plexus in relation with its walls; or a portion of its wall may yield and become the seat of aneurismal dilatation, as was most likely the case with the last patient.

ANGINA PECTORIS.

The consideration of the preceding cases of cardiac pain may possibly help us to the due understanding of the pathology and **treatment** of **angina pectoris,** which we must now examine.

The symptoms of the graver attacks of angina pectoris—those of the minor forms will be gathered from the preceding cases—are well known. The attack is prone to occur, especially on the first occasion, on the patient ascending some rising ground or making some slight muscular effort after taking food. The pain, which is very severe, suddenly seizes the patient in the sternal region, and is accompanied by a feeling of constriction of the chest, as though it were compressed in a vice ; the pain shoots through to the back and down the left arm usually, but sometimes also down the right. The agony is so great that the patient stands motionless, dreading sudden dissolution, and fearing to draw a breath, although the respiration is perfectly free. The face is usually pale and the hands cold. The pulse is very variable in character, sometimes weak and irregular, sometimes quite regular, and sometimes of heightened tension. The attack, as a rule, passes off suddenly, after a few minutes or even seconds, but it may last much longer, with varying intensity, or may assume the form of a series of paroxysms. As the attack passes off there is usually some eructation of gas, and often a copious discharge of urine. The attacks may only occur at long intervals, or they may be of frequent recurrence in the more serious forms. Mental emotion is often an exciting cause, and so are physical exertion and errors in diet, and dyspeptic states; distension of the stomach, with flatus, being especially prone to induce an attack. Unless, as is most frequently the case, there is serious disease of the heart, the health during the intervals between the attacks may be quite satisfactory. Although, in the greater number of cases, the attacks are apt to follow physical exertion and emotional excitement, it is not so in all cases; some of the most serious cases have occurred when the patient has been at rest, or have actually awoke him from sleep.

The classification that has been attempted of cases of angina pectoris, and their separation into distinct groups, appear to us somewhat forced and unnatural. We regard *angina* as a neurosal *incident* of cardiac, organic, or functional disease—most frequently the former. It is not a disease in itself; it is a phenomenon or manifestation of disease. The cardiac lesions underlying the anginal attacks may vary in their nature, but the anginal attacks maintain their resemblance to one another, differing only in their severity. We do not admit the *pseudo*-angina of some authors. Hysterical imitative anginas, however, certainly occur. But as the cases we have quoted conclusively show, there is simply a gradation of severity and curability between the so-called cases of *pseudo*-angina and those of *true* angina. The only sure ground of classification is the ascertainable absence or presence of cardio-vascular changes. We believe in all the graver forms of angina there exists a serious organic, cardiac, or vascular lesion, although not always detectable; and in the milder or curable forms we have simply to do with a cardiac neuralgia, or hyperæsthesia, induced either by temporary conditions of cardiac malnutrition or cardio-vascular strain; or it may be dependent on an inflammatory affection of branches of the cardiac plexus, itself dependent on an aortitis; or else it may be brought about by states of blood contamination; and in the latter case it is associated with vaso-motor excitement and increased arterial tension. We object to the term *vaso-motor* anginas as resting on a hypothesis that is by no means established or consistent with extended clinical observation. We have seen reason to regard the heightened arterial tension and "vaso-motor spasm" which has been assumed by some physicians to be the *cause* of anginal attacks as merely an *incident* of the same—an aggravating incident, no doubt, but not bearing a *causal* relation to the origin of the attacks. On further clinical observation, it will be found that heightened arterial tension is a frequent incident, probably of a reflex nature, in other neuralgias, and notably in neuralgia of the branches of the fifth nerve. We have seen in patients in other respects in perfect health, and free from neurotic tendencies, an attack of neuralgia of the superior maxillary nerve from dental irritation attended with marked increase of vascular tension, with a rise of 20 to 30 in the pulse rate, and the attack passing off with an excessive flow of clear urine.

It would seem that the shock or irritation of certain kinds of pain is able of itself, in some instances, to raise vascular tension to a remarkable degree, and we believe that in those cases of angina in which the arterial tension has been found to be increased (and there is no evidence that it is so in *all* cases, or even in the majority), this augmentation of vascular tension will be found to be a sequence, not a precursor, of the attack, a consequence of the shock of pain, a reflex irritation of the vaso-motor centres.

Our present object, however, is to seek for **indications for treatment,** and we must, therefore, briefly consider the known modes of *causation* of attacks of angina pectoris. And, first, with regard to those graver cases which are associated with serious structural disease of the heart and vessels. Now, when we consider that in by far the greater number of deaths from organic disease of the heart, in which we find all the various lesions present which have been found in fatal cases of angina, yet no true anginal attacks have ever been complained of; when we consider this well-known fact, we must admit there is some other additional circumstance needed to account for the angina. Certainly, obstructive disease of the coronary arteries has been found associated in a considerable number of cases with fatal attacks of angina, but extreme aortic regurgitation, extreme degeneration of the myocardium, and extreme dilatation of the cavities of the heart have no *necessary* causal relation to attacks of angina. The most serious forms of angina seem to have a complex causation: first, there *must* be a *neurosal* element, the nerves of the cardiac plexus suffer irritation, and a cardiac neuralgia or cardiac nerve pain of an intense character is excited, this acts as a shock to the motor nerves of the heart,* and in fatal cases the heart muscle on the verge of failure from organic causes is shocked by the attack of nerve pain, and if some reflex arterial spasm should be excited at the same time, it will have to encounter an augmented peripheral resistance as well. In such cases the *rapidity* of the fatal issue is no argument against the neuralgic nature of the angina. Here there is a *complex* association of depressing causes in the struggle with which the heart may fail and sudden death occur; or it may struggle successfully with the earlier attacks, but as its struggling power becomes exhausted it must finally succumb. We have pointed out how in certain conditions *strain* is apt to fall (when the aortic valves are competent) rather on the first part of the aorta than on the ventricular surface, and this more especially is the case in habitual high arterial tension; and we are disposed to think that anginal attacks are more prone to occur when the strain falls especially upon this part of the vascular system, which is in such close relation with the nerves of the cardiac plexus, than when the mitral or aortic valves are incompetent, and the strain is felt on the interior of the cardiac cavities. Certainly enormous distension of the *left auricle* and of the *left ventricle* may long exist without producing any symptoms analogous to angina. Prof. Grainger Stewart has remarked that he had "more than once seen a patient describe a curve on his chest like that of the aorta to indicate the site of his pain," and we have pointed out how counter-irritation over this region will often prove most effective in relieving the milder forms of cardiac pain.

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* It is quite possible, if the immediate *pre-anginal* state of the circulation were known, or had been observed, that a condition of cardiac excitement, of increased muscular action, caused the onset of extreme *nerve* pain, the shock of which *lowered* the cardiac action, and so led to the relief of the pain. This would explain the short duration of many of the attacks.

In the next place, let us inquire what is the *causation* of the less grave and more entirely remedial forms of angina. In these also the causation is in many instances complex. We may have a feeble, ill-nourished, cardio-vascular system, from anæmia, submitted to undue strain, as in the cases we have previously described, the strain, as we have just stated, falling, we believe, especially on the first part of the aorta; or we may have some intoxication, such as that of tea, tobacco, alcohol, gout, or some intestinal toxine, irritating the cardiac and the vaso-motor nerves, causing central irritability, increasing peripheral resistance, and so exciting anginal attacks, which may altogether pass away and be completely recovered from. *Vaso-motor spasm* as a unique cause of attacks of angina must, we think, be set aside as inconsistent with extended clinical experience. Cases of angina pectoris, both of the milder and graver forms, occur without any evidence of vaso-motor spasm or of heightened arterial tension, and the conditions of heightened arterial tension together with a feeble cardiac muscle very commonly co-exist without any tendency whatever to the development of anginal attacks; and we have already given reasons for concluding that when anginal attacks are found associated with heightened arterial tension, the latter may be a reflex consequence of the cardiac pain. The argument in favour of a vaso-motor causation of anginal attacks has been inferred from therapeutic experiment and the relief to the paroxysm that has attended the use of agents which cause arterial relaxations. But most, if not all, of these vaso-dilators are also *anæsthetics*, and, as Balfour has pointed out, it is to their anodyne action on the cardiac sensory nerves that they owe their chief efficacy; and Grainger Stewart has also pointed out that nitrite of amyl has a direct effect on nervous structures, and that it relieves other forms of neuralgia. We have seen a patient with his countenance purple and the vessels almost bursting from over-engorgement, due to the influence of nitrite of amyl, without the slightest relief to his anginal attack. But we readily admit that nitrite of amyl and its allies do relieve some anginal attacks, and, to a certain extent and in some cases, by the lowering of the vascular tension they produce, without, however, admitting that there is a direct causal relationship between the anginal attacks and heightened arterial tension.

With these preliminary considerations we are now in a position to formulate certain **indications for treatment.** These are :—

(1) To maintain or improve, when defective, the general nutrition, to avoid all strain, physical and emotional, and so to relieve cardiac feebleness and effort.

(2) To relieve dyspeptic conditions and flatulent or fæcal distension of the stomach and intestines.

(3) To forbid the habitual consumption of agents which may exercise a toxic action on the heart, as tea, coffee, tobacco, alcohol, etc., or which may introduce or develope toxines in the alimentary canal.

(4) To avoid and remove all gouty and other blood contaminations.

(5) To give such tonic remedies as may improve the cardiac tone and lessen existing tendencies to cardio-vascular degeneration.

(6) To relieve the paroxysmal attacks by sedatives and stimulants.

1. Anginal attacks occurring in persons who present signs of anæmia, and defective nutrition generally, must be encountered, in the first place, by attention to hygienic measures. Such patients must be removed from all causes of physical or mental strain. Their life must be one of complete repose of mind and body—a repose alternated with gentle physical exercise, always stopping short of the slightest fatigue; it is good for them, however, to be much in the open air, driving, sailing, or reclining, and in a mild climate, when possible, so that they shall be protected from the injurious effects of cold, exposure to which certainly favours the occurrence of these attacks, not only by lowering the nervous force, but by checking free cutaneous circulation and elimination. Much attention should also be paid to their diet.* It should be of the most nutritious nature, so far as is consistent with ease of digestion. An almost exclusive milk diet will be found to be of great service in many cases. When the digestive powers are greatly weakened, it may be necessary to have recourse to pre-digested foods, or to give with the food some artificial digestive agent, such as pepsin or pancreatine. We have found a wine-glassful of cream mixed with the same quantity of hot water, and a teaspoonful of sal volatile added, an excellent food on getting up in the morning. The lighter kinds of fish—soles, whiting, flounders, etc.—simply grilled, and eaten with a squeeze of lemon and plain uncooked butter, are excellent; lightly boiled or

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* It is very common to advise such patients to take food at *short* intervals. Now, if this instruction is given, it should be pointed out that the food must be *fluid*, and must remain *fluid* in the stomach. The digestive functions of a person in feeble health are not *quickened*, but the contrary; and to give *solid* or coagulable food at *short* intervals in such cases is only to aggravate dyspeptic states.

poached eggs are permissible, if there is no gouty tendency; and also good *consommé*, flavoured with vegetables; the lean of fresh meat, well minced and lightly cooked, is most digestible and nourishing; fresh vegetables in the form of *purées* are useful, and so is the pulp of cooked fruits, as affording the necessary variety in the food and promoting the action of the bowels. Light milk puddings are also commendable. We should also see that a sufficient quantity of pure water is consumed, for eliminative as well as assimilative purposes.

This first indication cannot, however, be thoroughly carried out without due regard to the second—viz. *to relieve dyspeptic conditions and flatulent and fæcal distension of the stomach and intestines.* The coexistence of dyspeptic states must be treated in accordance with the principles already laid down in another chapter. An alkaline bitter stomachic, composed of sodium bi-carbonate, nux vomica, and calumba, an hour before the two principal meals, will be found valuable. Or in other cases a dose of dilute hydrochloric acid in compound infusion of orange-peel after food, with or without the addition of a few grains of pepsin, may be given. Flatulent distension during digestion will often be effectually relieved by a pill containing a grain of thymol or a drop of creasote taken directly after food. Regular evacuation of the bowels is most essential—checking, as it does, the formation of injurious toxines in the intestine, eliminating waste substances, and relieving abdominal distension. For some persons the best aperient is a dinner pill, containing a grain or two of aloes, half a grain of powdered ipecacuanha, a grain of nux vomica powder, and a grain of soap; this may be taken before or after dinner. Should such a pill prove insufficient, it may be followed by a teaspoonful of Carlsbad or Homburg salts in half a tumblerful of hot water the next morning. In cases where there is sluggishness of liver, with bile-stained conjunctiva, a few grains of blue pill, or $\frac{1}{6}$ or

$\frac{1}{4}$ of a grain of podophyllin at bed-time, with 2 or 3 grains of compound rhubarb pill, may take the place of the dinner pill.

3. The next indication is also an important one; for certain of the slighter forms of angina are no doubt dependent on, and the more serious forms may be provoked by, the habitual use of certain substances which come, in course of time, to exercise a **toxic** action on the heart. The action of these toxic agents is all the more subtle because they may be taken for many years without apparently producing any injurious effect, and it is often difficult to convince a patient that what he has so long done with impunity has at length become injurious. This is particularly the case with **tobacco,** the toxic effects of which on the heart are often delayed until, or even after, middle age, when they will perhaps somewhat suddenly make themselves felt. With regard to alcohol, it is singular to observe how in different individuals its toxic and degenerating influence will sometimes fall on one organ, and sometimes on another. The cardio-vascular system in some persons is especially prone to undergo serious degenerative changes under its influence, while in others it almost entirely escapes, and hepatic and gastric troubles more especially arise, and in women the peripheral nervous system is most prone to be affected; but whenever anginal symptoms arise, we should always insist either on complete abstinence from alcohol, or on its very sparing use in a very dilute form. Tea and coffee are often provocative of the slighter manifestations of cardiac pain and discomfort, and it is noteworthy that they are particularly prone to be aggravated by any emotional disturbance. All these toxic agents must be forbidden so long as any tendency to anginal attacks exists.

The fourth indication is to remove and avoid all gouty and other blood contamination. The importance of **elimination** in the treatment of angina pectoris is universally admitted; and we desire to emphasise the importance of a free evacuation of waste products from the system. When renal elimination is defective from the co-existence of renal degeneration, we must act freely on the bowels and on the skin. When the kidneys are sound, the free use of pure water, or some suitable mineral water having some slight stimulating action on the kidneys, may avoid the necessity of free purgation; but in all cases a thorough daily evacuation of the bowels should be procured, and free action of the skin should be maintained by warm baths and frictions. In gouty cases, and in all cases of defective elimination, a careful and spare but adequate diet should be prescribed. Animal food should be taken only in great moderation, and fresh vegetables and fruit, carefully cooked and prepared so as to be made easy of digestion, should take its place. All alcoholic stimulants should be avoided; and when milk is not unacceptable to the patient a few weeks of an exclusive milk diet may be advantageous.

In the fifth place we come to the consideration of the medicinal treatment of these cases, and first of the appropriate treatment in the intervals.

In anæmic cases and cases of temporary cardiac debility from removable malnutrition, we shall find the milder preparations of iron combined with small doses of digitalis, such as we have already described in the early part of this chapter, of great service. In other cases we shall find **arsenic** of greater value than iron; there is a general consensus amongst experienced physicians as to the value of arsenic in the treatment of cases of angina pectoris in the intervals between the paroxysms. Balfour asserts that arsenic is "indispensable in all forms of weak heart accompanied by pain."* He advises that it should be given in the form of Fowler's solution, 3 to 5 minims, combined with iron and strychnine, twice a day, after food. We cannot too strongly insist on the value of strychnine as a cardiac tonic, especially in remediable states of cardiac asthenia. In highly neurotic cases much benefit may be derived from a combination of iron or arsenic and potassium or sodium bromide, in 5- to 15-grain doses; and in the same class of cases the valerianate of zinc is also of great service; it may be given in grain doses in a coated pill thrice daily, after food; and sometimes the combination of $\frac{1}{60}$ of a grain of phosphorus with it renders it a more valuable nerve-tonic.

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* "Diseases of the Heart," 2nd edition, p. 313.

We have already pointed out the usefulness of digitalis in the milder cases; and we have seen long periods of immunity from attacks apparently brought about by occasional recourse to a mild iron tonic, with 5-minim doses of tincture of digitalis, or a pilule of Nativelle's digitaline ($\frac{1}{100}$th grain). The idea of giving a combination of nitro-glycerine and digitalis, during the intervals, is a concession to the vaso-motor hypothesis of the mode of causation of the attack, to which we shall immediately recur.

There is another remedy which is of very great value in the treatment of angina pectoris, especially when it is associated with obvious signs of cardio-vascular degeneration and of the gouty state, and that is potassium iodide.* It checks the progress of degenerative changes, it stimulates glandular organs, and efficiently promotes elimination, and it appears also to prevent vaso-motor irritability—all these effects may depend on its eliminative properties. It is one of the most efficient anti-neuralgic agents in other forms of nerve-pain. It may be given in 5- to 15-grain doses, three times a day.

In cases traceable to *malarial* intoxication, if arsenic fails to relieve, quinine should certainly be given; but in such cases evidence of arterio-sclerosis will usually be present, and will indicate the use of potassium iodide. It has recently been stated that cocaine, in doses of $\frac{1}{3}$ of a grain, thrice daily, has the power of entirely preventing attacks of angina; if a further experience should prove the accuracy of this statement, it would go far to support the view that the anginal attack is dependent on a hyperæsthetic condition of the cardio-sensory nerves.

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* *G. Sée* considers it acts as a powerful *vaso-dilator*, its action extending to the coronary arteries when given in large doses, 30 to 45 grains, thus promoting both the nutrition and the contractile power of the heart.

Sixthly. It only remains to consider the indications for the relief of the paroxysmal attacks. Those who see in the causation of the anginal paroxysm the predominating influence of vaso-motor spasm consider the main indication for the relief of the paroxysm is to administer medicinal agents which are known to have the power of relaxing the arterioles, and so of lowering arterial tension, and, to that extent, to relieve the heart of a certain amount of the peripheral resistance it has to overcome. They therefore advocate the use of the *nitrites*, such as the nitrite of amyl, nitro-glycerine, and sodium nitrite. That these agents do relieve the paroxysm in many cases of angina is certain; that they do so wholly by their action as vaso-dilators is extremely doubtful. They are capable of relieving the anginal attack when there is no certain evidence of the existence of vaso-motor spasm. Dr. Douglas Powell says he has found them "far more reliable in the graver cardiac cases than in the purer vaso-motory,"* but it is in the latter that they should prove most efficacious if the prevailing theory of their action were true. Balfour and Grainger Stewart both believe that they act as direct analgesic agents, and that they have the power of relieving pain in other as well as in cardiac neuralgias, independently of their relaxing action on the blood-vessels; and this view we adopt, as the most consistent with the clinical history of this disease.

Nitrite of amyl is best administered by inhalation. A capsule containing 3 or 5 minims should be broken in a handkerchief, and inhaled. In some cases, however, it entirely fails to relieve, although it may produce, in a most marked form, its characteristic effect of dilating the vessels. Nitro-glycerine is preferred by others, and it has been pushed until very large doses have been taken—as much as 35 drops of a 1 per cent. solution have been given and repeated at short intervals during an attack, and 7 minims three times a day in the intervals.* We should begin, however, with much smaller doses—1 to 2 minims of the 1 per cent. solution. Whitla recommends still smaller doses—$\frac{1}{1000}$—very frequently, so as to maintain the effect and avoid the severe headaches which often follow the larger doses. Sodium nitrite may also be employed for the same purpose; its effect is said to be more lasting than that of nitrite of amyl and nitro-glycerine. It is given in tablets of $2\frac{1}{2}$ grains; one to four of these may be given for a dose. At the onset of an attack, in addition to the inhalation of nitrite of amyl, which, owing to the rapidity of its action, is the most suitable remedy to start with, we may give some warm diffusible stimulant, such as 30 minims of sulphuric ether, or a dram of nitrous ether, with a dram of sal volatile or a little brandy in an ounce or two of peppermint water. The feet and hands, if cold, may be placed in hot water. Balfour says he has been disappointed in the action of nitro-glycerine, and prefers inhalations of nitrite of amyl; and when these fail—as they often will—he resorts unhesitatingly to chloroform inhalations, and he adduces a great weight of evidence in favour of his contention that "so far from being unsafe in cardiac disease, it is often of the greatest use in these cases."† Sulphuric ether is used also for the same purpose, but, as Balfour says, "it is not rapid enough. Chloroform acts more quickly, even more effectually, and is perfectly safe." He gives it poured on a sponge in a smelling-bottle, and the patient is told to breathe it through his nose as deeply as possible. "In this way relief is obtained in a few seconds, and so soon as the narcotic influence is produced the smelling-bottle drops, and with it rolls away all risk of any overdose." In severe and protracted attacks we may be obliged to have recourse to hypodermic injections of morphine. A sixth or a quarter of a grain may be injected for a dose.* Morphine seems to be better tolerated in cases of cardiac pain with a weak heart than when it is given to relieve other neuralgias in the same circumstances. When it is given to relieve cardiac pain, there seems to be less risk of its causing cardiac depression. It is, however, a good plan to give some ether and ammonia mixture at the same time, to counteract any such possible depression. The ethereal tinctures of valerian and of castor have been found useful. The inhalation of *pyridine* has been said to give immediate relief, but the unpleasant penetrating odour of this substance makes patients object greatly to its use. Bromide of ethyl has also been used in inhalation. We have already remarked on the value of counter-irritation in the form of flying blisters in those cases where a chronic aortitis may have involved contiguous branches of the cardiac plexus. A hot mustard poultice to the præcordial region may be useful at times. The application of the continuous electric current along the course of the vagus, in the neck, and down the arm, in cases where a distinctly painful *aura* is experienced in the hand, has been found useful in warding off attacks. Leeches applied over the sternal region and repeated small bleedings from the arm have been found useful.

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* *Transactions* of Medical Society, vol. xiv. p. 276.

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* *Transactions* of Medical Society, vol. xiv. p. 291.

† "Diseases of the Heart," 2nd edition, p. 309.

* *Dujardin-Beaumetz* ("Clinique Thérapeutique," 5th edition, vol. i. p. 154) mentions a case of *angina pectoris* associated with aortic valve disease, in which it was possible to avert the attack by the hypodermic injection of morphine. In this case the patient usually had a warning of the attack in the shape of a pain in the left hand, which mounted to the shoulder, and at last reached the heart. If morphine was injected as soon as pain was felt in the hand, the attack was prevented.

ADDITIONAL FORMULÆ.

Drops for palpitation.

℞ Tinct. digitalis, 2 drams.
Tinct. valerianæ, 2 drams.
Tinct. ferri acetatis æther., 3 drams.

M. f. mist. Twenty-five drops in water three times a day. (*Schnitzler.*)

For functional palpitation.

℞ Spr. ammoniæ arom., 1 oz.
Æther. sulphuris, 2 drams.
Tinct. zingiber., 3 drams.
Ess. menthæ pip., 3 drams.
Spr. camphoræ, 3 drams.
Tinct. cardam. comp. ad 3 oz.

M. f. mist. A small teaspoonful in a wineglass of water every fifteen minutes whilst the palpitation and difficulty of breathing are severe. (*Whitla.*)

Another.

℞ Acidi hydrobromici dil., 6 drams.
Tinct. belladonnæ, 3 drams.
Tinct. nucis vom., 2 drams.
Glycerini purif., 1½ oz.
Tinct. quininæ ad 6 oz.

M. f. mist. A dessert-spoonful in two tablespoonfuls of water three times a day before meals. (*Whitla.*)

For neurotic palpitations.

℞ Tinct. digitalis, 30 minims.
Potassii bromidi, 5 drams.
Aquæ ad 10 oz.

M. f. mist. One to three tablespoonfuls daily. (*Huchard.*)

For palpitations connected with masturbation.

℞ Potassii bromidi, 5½ drams.
Tinct. digitalis, 2½ drams.
Infusi cascarillæ, 4 oz.

M. f. mist. A dessert-spoonful two or three times a day. (*Da Costa.*)

Pills for nervous palpitation.

℞ Pulv. digitalis, 75 grains.
Pulv. asafœtidæ, 75 grains.
Syrupi, q.s.

Ut f. pil 100. One to four pills daily. (*Withering.*)

For the anginal paroxysm.

℞ Spir. ammon. arom., 1 dram.
Sodii bicarb., 10 grs.
Tinct. cardam. co., 1 dram.
Spir. chloroformi, 20 min.
Sol. nitro-glycerine (1 per cent.) 1 min.
Aquæ ad 1½ oz.

M. f. haust. To be slowly sipped on the commencement of symptoms. (*Powell.*)

In anginal attacks.

℞ Ethyli bromidi, 1 part.
Aquæ destill., 200 parts.

M. Two to four tablespoonfuls for a dose. (*Seguin.*)

For the intervals in angina pectoris.

℞ Quininæ sulph., 30 grains.
Acidi arseniosi, ½ grain.
Extr. valerianæ, q.s.

Ut f. pil 30. Two to four daily. (*Gallois.*)

For the anginal attack.

℞ Tinct. digit., 1 dram.
Tinct. bellad., 1 dram.
Tinct. valerianæ, 1 dram.
Spr. ætheris comp., 1 dram.

M. f. tinct. Ten to twenty drops during the attack. (*Gallois.*)

Arsenical drops for angina.

℞ Liq. arsenicalis, ½ dram.
Aquæ cannelæ, ½ oz.

M. Two to five drops twice a day. (*Bamberger.*)

CHAPTER VI.

THE TREATMENT OF DISEASES OF THE ARTERIES: ARTERIO-SCLEROSIS—ATHEROMA, OR ENDARTERITIS DEFORMANS—ANEURISM.

ARTERIO-SCLEROSIS, or Atheroma—Its Nature and Causation—Heredity—Vascular Strain—Athletic Exercises—Toxhæmic States—Dietetic Excesses and Errors—Effects of heightened Blood Pressure—Necessity for *Treatment* in early Stages—Potassium Iodide—Eliminative Measures—Mineral Waters—Exercise—Food—Hygiene.

INTERNAL ANEURISM—Causation—Degenerative Changes—Sudden Strain—Syphilis—*Symptoms*—The Form of the Aneurism influences its Curability—*Indications for Treatment*—Blood-letting—Rest and restricted Diet—The *Tuffnell* Method—Objections to it—Modifications of it—*Potassium Iodide*—*Electrolysis*—Introduction of *Foreign* Bodies into Sac—*Distal Ligature*—*Proximal Pressure*—MacEwen's Method—Ergot and Ergotin—Ice—*Treatment of Symptoms*—Pain—Dyspnœa—Anginal Attacks. Additional Formulæ.

THE arteries are prone to undergo degenerative changes, fatty, calcareous, and hyaline; but that which chiefly concerns us here is the disease affecting the walls of arteries, known as *atheroma*, or *endarteritis deformans*, or **arterio-sclerosis,** the existence of which in the large vessels is one of the chief conditions on which the occurrence of **aneurism** depends.

ARTERIO-SCLEROSIS.

This affection of the arteries appears to be a true *arteritis*, the inflammation attacking chiefly the middle coat (*mesarteritis*), and involving also the adventitia (*periarteritis*); it is attended with infiltrative and degenerative changes, and weakening of the walls of the vessel occurs in consequence. The proliferative changes and thickening which at the same time occur in the *intima* are regarded as *compensatory*, and in the early stage before these occur rapid dilatation at the weakened spot may take place, and thus an *aneurism* be formed.

Atheroma is a process of chronic inflammation, followed by degeneration. The so-called "*atheromatous ulcer*" is formed by the breaking down of the degenerated tissue and rupture of the endothelium, with the production of a "branny detritus," or molecular *débris.*

Diffuse arterial changes of this kind are common. They occur in old people as a **senile** change, and are caused by the wear and tear or natural strain to which the arterial tubes are subject. But such changes also occur prematurely in certain comparatively young persons, when their arterial tissues are especially vulnerable, so that chronic arteritis readily arises from relatively slight irritation. This vulnerability would seem, in some cases, to be inherited. "Entire families sometimes show this tendency to early arterio-sclerosis, —a tendency which cannot be explained in any other way than that in the make-up of the machine bad material was used for the tubing."*

Strain of the arterial walls from excessive internal blood-pressure is the chief factor in the direct production of these changes. One of the most common causes is the practice of athletic exercises by persons not well adapted by their original conformation to such efforts. Severe athletic exercises, even in the muscularly strong and robust, if pushed beyond a certain degree, tend to be followed by the morbid results of arterial strain; how much more so must this be the case when such exercises are undertaken by persons of feeble organisation, whose nervous energy and emulation prompt them to these unequal contests?

These arterial changes are also induced by constitutional blood conditions, acting either as *direct* irritants to the arterial tissues or *indirectly* by causing heightened blood-pressure. Alcohol, gout, rheumatism, lead, syphilis (this last probably excites a *specific* arteritis), may any of them cause endarteritis. The poisons of certain fevers, especially malarial fevers, have the same effect on certain constitutions.

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* Osler, "Practice of Medicine," p. 6C4,

Over-filling of the blood-vessels from excess of food and drink, when combined with indolence, may also become a cause of this condition.

Diffused *arterio-sclerosis* (*arterio-capillary fibrosis*) is often found associated with *renal* changes, cardiac hypertrophy, and "fibrous myocarditis." In some cases the *renal* changes may be primary and the arterial secondary; but in many others the arterial sclerosis appears to precede the renal affection.

In the *pulmonary artery* and its branches sclerosing changes are found as a consequence of continued increased tension in the pulmonary vessels, caused by mitral disease and emphysema. Similar changes have been found in the venous system (*phlebo-sclerosis*) after exposure to heightened blood-pressure.

Considering the serious nature of the many morbid changes (apart from large aneurisms, which will be considered separately) to which arterial degeneration gives rise, the **treatment** of the earlier stages of this affection has scarcely received adequate attention. When we encounter, on examining a patient who may be thought to be in sound health (a candidate for life assurance, for instance), or who may complain of some trifling derangement, a pulse of high tension, arteries more or less palpably thickened, elongated, and tortuous (we should examine the *brachials* for this purpose as well as the *radials*), some evidences of ventricular hypertrophy, and an accentuated aortic second sound, we should estimate adequately the danger to which such a person is exposed. Should the *coronary* arteries become involved there is the probability of attacks of *angina pectoris*, and the certainty of cardiac degeneration. Should the *cerebral* arteries be especially affected, we may encounter symptoms of cerebral degeneration, or of cerebral hæmorrhage from rupture of miliary aneurisms. Degenerative pulmonary emphysema and asthma are not uncommon accompaniments of this disease. *Renal* degeneration and wasted kidneys may be a consequence, as well as a cause, of arterio-sclerosis. Are we helpless to prevent the development of these serious morbid states? By no means. If such patients will be content to follow a rational and strict *régime*, hygienic, dietetic, and medicinal, not only may these risks be kept in abeyance, but a distinct improvement in the condition of the arterial system may be brought about. In the first place, it is necessary to seek out evidences of any constitutional vice that may need rectifying. Syphilis ought never to be overlooked; and even should we be in error in suspecting its existence, a mild anti-syphilitic treatment cannot do harm; and it is a great advantage that small doses of *potassium iodide* long continued are as useful in the gouty and rheumatic as in the syphilitic forms, and many Continental physicians maintain that this drug is a true tonic to the heart. We do not share this view, but we believe that the improved cardiac action which is observed to follow its use depends rather on its remarkable eliminative effects and its consequent influence on the blood-vessels, removing peripheral resistance, and so diminishing arterial tension. We should give it in 3- to 5-grain doses three times a day, combined with 5 to 10 grains of potassium bicarbonate, 20 minims of aromatic spirits of ammonia, and an ounce of a bitter infusion, such as calumba, gentian, or serpentary; and we should continue its use, with occasional interruptions of ten or twelve days, for three or four months at a time; and the bowels should always be kept freely relieved by some suitable aperient; and if dyspeptic symptoms and constipation are prominent conditions, occasional courses of mineral waters will prove of much value. But their use must be wisely directed, as any over-filling of the vessels must be guarded against, and it must be seen that the water ingested passes freely away by the kidneys or bowels, or by both.

In the corpulent, the waters of Marienbad, Kissingen, Tarasp, or Brides, or others of this class, are most suitable; for the thin and ill-nourished dyspeptic, Vichy, Royat, Neuenahr, Baden-Baden, and also

Kissingen, may be recommended. Tepid baths of short duration, combined with friction of the skin, are of value for promoting cutaneous excretion, but long-continued hot baths must be avoided. Regular moderate exercise in good air, always stopping short of fatigue, is to be encouraged, but all violent or strenuous muscular exertion and all participation in athletic games should be strictly prohibited.

The food should be limited to the actual wants of the system. The meals should be small and at adequate intervals; they should be eaten slowly, and no fluid should be taken with the meal, but afterwards. Fresh vegetables may be eaten freely, but animal food and eggs only sparingly. Alcohol and tobacco should be abstained from. A milk diet proves very useful in some cases, especially when it promotes free diuresis.

Sexual excitement is certainly undesirable; and emotional disturbances should, as far as possible, be guarded against. The body should be warmly clad, and exposure to extremes of heat and cold avoided; a bright, genial, sunny climate in winter is a great advantage.

We now pass on to the consideration of the most serious manifestation of arterial disease, namely,

ANEURISM, INTERNAL.

The *medical* aspects of aneurism are confined almost exclusively to those affecting the aorta and the large arterial branches that spring from it within the thorax and abdomen, *i.e.* to "*internal* aneurisms." Aneurisms of the arteries of the limbs, often traumatic in their origin, fall under the care of the surgeons, and are especially amenable to *surgical* treatment—compression, ligature, etc.

Aneurisms usually arise from a weakening of some part of the wall of an artery, such as the aorta, by chronic inflammation and degenerative changes such as we have already described; the wall of the artery is predisposed to yield in consequence of these changes, but some sudden strain, accidental or otherwise, is often the immediate cause of an aneurismal dilatation. Mechanical violence, or any strain put upon the arteries, suddenly or repeatedly, may lead to the production of an aneurism of the aorta when its walls are weakened by chronic disease. **Syphilis,** as the cause of a specific form of arteritis, is frequently concerned in the etiology of aneurism.

The **symptoms** of aortic aneurism are chiefly those dependent on pressure of the tumour on adjacent parts or organs, and they vary, therefore, according to its situation and mode of growth in relation to surrounding structures. The dangers attending it are partly dependent on those pressure symptoms and partly on its tendency to rupture. An aneurism, for instance, affecting the arch of the aorta, situated as it is in the vicinity of most important structures, may, it is clear, in its development and growth give rise to the most serious and distressing symptoms from compressing adjacent structures, and these have to be considered in the treatment of the case, as they frequently lead to a fatal issue independently of any rupture of the sac.

The *form* of the aneurismal dilatation will greatly influence the probability of cure by suitable treatment. A *cylindrical* or *fusiform* aneurism, affecting, that is, the whole circumference of the aorta, is not amenable to curative measures, and a *sacculated* aneurism will be more or less so according as its communication with the artery is by a small or large opening.

Internal aneurisms are cured by the deposition of layers of coagulated fibrin within the sac, their organisation and the subsequent obliteration of the sac by contraction or inflammation. The **indications for treatment,** therefore, are to lessen the force and frequency of the heart-beat, and so slow the current of blood in the aneurismal sac; to lessen arterial tension; to increase the coagulability of the blood in the sac. By these means we may hope to promote obliteration and contraction of the sac when the anatomical conditions are favourable.

Various methods have, from time to time, been suggested and practised for the purpose of giving effect to these indications: many of them have completely failed and are no longer employed.

The repeated abstraction of blood with the view of reducing blood-pressure, slowing the current of blood in the sac and so favouring coagulation, was advocated by Valsalva and practised by Dr. Hope* to the extent of withdrawing 12 ounces of blood daily for sixteen consecutive days. This method was combined with a strictly limited diet and prolonged and absolute repose. But this method instead of quieting the heart-beat often caused cardiac excitement and irritability, and too great restriction in diet lessens and does not increase the coagulability of the blood.

Another method somewhat analogous to the preceding, without the bleedings, has had many advocates. It consists in a severe restriction of the diet, both in solids and liquids, together with absolute rest in the recumbent position for a protracted period. It has been termed the "**rest and starvation**" method. Its objects are to reduce the quantity and fluidity of the blood and so increase its coagulability, to lessen intra-arterial tension, and to reduce greatly the frequency of the heart-beat.

Tufnell, who adopted this method with some success, pointed out that for this treatment to be successful three conditions were essential: first, the aneurism must spring from the front of the vessel; second, the sac must be perfect; and third, there must be a fibrinating power in the blood. He limited the quantity of fluid taken to 8 ounces in the day—2 ounces of milk or cocoa at breakfast, 4 ounces of water or light claret at dinner, and 2 ounces of milk or cocoa at tea or supper. There is, however, in practice, great difficulty in keeping the fluids down to this limit, and some patients find the thirst attending the attempt intolerable. The solids were limited likewise to 10 ounces daily—2 ounces of bread and butter at breakfast, 3 ounces of cooked meat and 3 ounces of bread or potatoes at dinner, and 2 ounces of bread and butter at tea or supper.

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* Dujardin-Beaumetz, "Clinique Thérapeutique," 5th edition, vol. i. p. 195.

This treatment by enforced rest in the recumbent position and the above diet was to be maintained for three months or longer. Great difficulties occur in carrying out this method. Certain temperaments bear the enforced rest badly; they become introspective and fretful, and the heart's action becomes hurried and irritable instead of being quieted. Others become weak and anæmic, and the injury to the general nutrition they suffer seems to aggravate their condition and to promote the further advance of degenerative changes. In such instances this method should be abandoned or greatly modified. In fairly strong and vigorous patients of calm and placid temperament, successful results may, no doubt, occasionally be obtained from this treatment. In applying this system it is important to see that the patient's bed is comfortable, that the surroundings are cheerful, that he is spared all worry and excitement. The tendency to constipation which necessarily attends this method must be overcome by suitable aperients or enemata, as straining at stool must not be permitted, and sexual intercourse must, in all cases, be strictly forbidden.

A modification of this method, in which the patient is kept as much at rest as is consistent with his comfort and general health, the consumption of liquids is restricted to the quantity absolutely necessary, and a somewhat greater quantity and variety of food are permitted, will be found to be attended with as much or even greater benefit in the majority of cases.

One of the most generally accepted methods of treatment of aortic aneurism, and that from which we have ourselves obtained the best results, is the administration of full doses of **potassium iodide**, together with a careful mode of living, especially as to diet and exercise. The dose should be from 10 to 20 or 25 grains three times a day. Some difference of opinion exists as to the dose that should be given. Some consider 15 grains three times a day the limit, others think better results are obtained from larger doses; 15 grains three times a day we have found sufficient in many cases, but in others we have not obtained the best results until we have increased the dose to 30 and even 40 grains thrice daily.

Amendment is often observed to speedily follow the institution of this treatment; pain is relieved, the force of the pulsation in the aneurism is distinctly lessened, and the area of dulness diminished, and in some cases complete consolidation of the sac seems to be induced. It is somewhat difficult to explain the mode of action of this remedy. Balfour thinks it exerts a special influence on the wall of the sac, causing thickening and contraction. It certainly lowers blood-pressure and so favours contraction of the sac by relieving tension within it. It has been suggested that it may thicken the blood by increasing the secretions, especially that of the kidneys.

One great advantage of this treatment is that it does not necessarily demand a cessation of all occupation, and one of our own patients, an enthusiastic and restless musician, conducted a large orchestra for many years with a large aortic aneurism, while taking 40 grains of potassium iodide thrice daily.

In determining the dose most suitable to each case, one should be guided by the pulse-rate; if the larger doses increase the pulse-rate, we should return to the smaller ones.

The *sodium iodide* has been recommended by *Huchard* as less depressing and better tolerated than the potassium iodide, and it may be employed when any difficulty is experienced in taking the latter.

The known coagulating power of the **electric current** on albumen has led to its application in the treatment of aneurismal tumours, with the object of producing coagulation within the sac. The electrolytic treatment of aneurism has been extensively applied, and much was hoped from it, but it has lost some of its repute since the potassium iodide treatment has been found to be attended by such good results.

This method is, however, still occasionally applied, especially to aortic aneurisms, in which the sac projects considerably on the surface. Two, three, or more needles, according to the extent of the sac, should be introduced, and they should be directed rather towards the periphery of the sac than towards the aorta, as it is of great importance to avoid the formation of a coagulum near the general blood current. The needles must be covered at their upper part with a protective non-conducting coating, to avoid the corrosive action of the electric current on the tissue pierced by them. The needles may, in the case of a large sac, be introduced into different parts of the sac at different sittings. It seems best to connect the needles with the *positive* pole only, as the clot formed is firmer than with the negative pole, and to apply the latter connected with a large copper electrode to the adjacent surface.

The sitting should last for ten to fifteen minutes, and the strength of the current should not exceed 10 to 20 milliamperes. In some successful cases there have been as many as thirteen sittings at intervals of three to six days.

In this, as in all other methods of treatment, the more completely sacculated the aneurism is, and the narrower is its orifice of communication with the aorta, the better are the results likely to be.

The introduction of *foreign bodies* into the sac of the aneurism, with the view of promoting coagulation in it, such as considerable lengths of watch-spring, of iron or silver wire (with or without electricity), of horse-hair, etc., need not detain us, as the effect of these methods of treatment has been, in most cases of aortic aneurism, disastrous.

The method of **distal ligature**, that is, the application of a ligature to the vessel (or its branches) beyond the aneurism, and not between it and the heart, has been suggested and applied in cases of aneurism of the aorta, and the innominate. Ligature of the left carotid has been undertaken for aneurism of the aortic arch, and ligature of both the right subclavian and carotid for aneurism of the innominate or of the first part of the aorta. When cure of the aneurism follows this operation, it has been suggested that it is through the formation of a clot on the proximal side of the ligature, and the extension of this down the artery into the sac. It is only applicable to a very limited number of cases, and should not be resorted to in any case until other less serious methods have been tried and have failed to arrest the progress of the aneurismal tumour; twenty-three out of thirty-five cases in which this operation was performed "died outright, or were hastened to a fatal termination by the operation."* A cure is said to have resulted in six of these cases, but *temporary arrest* would seem to be the fitter term to apply, as a survival of 4½ and 3½ years is scarcely the same thing as a *cure*.

It is unsuitable in cases in which there is evidence of general atheroma or of valvular cardiac disease, or of any visceral complication. It is most promising in distinctly sacculated cases arising suddenly from over-exertion or injury.

The method of **proximal pressure,** *i.e.* pressure applied to the aorta between the heart and the aneurism, has been applied successfully in a certain number of cases of aneurism of the abdominal aorta; the object of the operation being to slow or obstruct the blood current sufficiently to allow of coagulation within the sac and so cause its obliteration.

The cases in which this method has been successful have been healthy young men in whom, it may be assumed, the rest of the vascular system was free from disease, and in whom the local disease probably originated in injury or over-exertion. The method of operating is as follows: the patient being anæsthetised, a Lister's tourniquet is carefully adjusted in position over the abdominal aorta and above the tumour, and slowly screwed down, care being taken to avoid, as much as possible, injury to the intestines. The aorta is compressed until all pulsation in the aneurism and in both femorals is arrested. The lower limbs are, at the same time, enveloped in cotton-wool and flannel, and kept warm by hot-water bottles. In Mr. Durham's successful case the compression was maintained for 10½ hours. Greenhow had a successful case in which the abdominal aorta was compressed, first for ¾ hour, again for 4 hours, and again, after some days' interval, for 8 hours.

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* Pepper's "System of Practical Medicine," vol. iii. p. 819.

This method is quite unsuited to cases associated with general arterial degeneration, for by shutting off the blood from the lower half of the body, the tension in the arteries of the upper half becomes extreme; and it is a method obviously attended with grave risks, and in a considerable proportion of the cases in which it has been applied, death has resulted directly from the effect of the operation; it would seem to be suitable only to those cases in which, the rest of the arterial system being healthy, the tumour is rapidly enlarging, and when other milder means have failed to arrest its growth.*

Dr. MacEwen has described a method of producing what he terms "White Thrombi" within the aneurismal sac by a process of inflammation excited in the wall of the sac by irritation with the point of a pin passed into the sac with strict antiseptic precautions, and carried across it until it reaches the opposite wall, where it is left for some hours so that the movement imparted to it by the blood current may cause it to scratch the surface of the sac and excite the necessary amount of irritation. Different parts of the sac may be acted upon by the same needle without its withdrawal. He believes that this illustrates an important principle in attempts to procure consolidation of an aneurismal sac, and the cases he cites in support of his views, although but few in number, appear to merit further consideration, and the method he describes has this to recommend it —that it is easy to carry out and involves none of the serious risk which attends most other surgical modes of treatment.*

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* Dujardin-Beaumetz recommends that at the first sittings the compression of the abdominal aorta should be *incomplete*, and should gradually be made complete; and that this compression should not be immediate and total. ("Clin. Thérap.," vol. i. p. 204.)

The administration of *ergot* in large doses, and the hypodermic injection of *ergotin*, have been advocated in the treatment of aneurism, the former by Sibson and the latter by Langenbeck; both these authorities appear to have thought that this drug could cause contraction of the sac by its action on the muscular fibre in its walls, but repeated examination has demonstrated the absence of muscular fibre in the coats of the aneurism. It has, however, been maintained that ergot, when given in large doses, does diminish the volume of the aneurism and greatly lessens its pulsation,† and that it acts by diminishing the ventricular diastole, and limiting the output of blood. On the other hand, the rise of blood-pressure which attends the use of ergot would seem to counter-indicate its administration in internal aneurism. It is certain that this method of treatment has gained few supporters. Dujardin-Beaumetz repudiates it,‡ Professor Shattuck speaks of it as having justly fallen into disuse,|| and Osler § says it is "rarely, if ever," of service in thoracic aneurism.

The application of **ice** or of refrigerating mixtures to the aneurismal tumour, when it projects on the surface, has been advocated not only for the purpose of allaying pain, but with the idea that it may possibly promote coagulation; and, no doubt, if

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* For full details of this method we must refer to Dr. MacEwen's paper, which will be found in the *British Medical Journal* for Nov. 15 and 22, 1890.

† Dr. Broadbent, *Transactions* of Medical Society of London, vol. xiii. p. 133.

‡ "Clinique Thérapeutique," vol. i. p. 204.

|| Hare's "System of Practical Therapeutics," vol. ii. p. 770.

§ "Practice of Medicine," p. 680.

applied over the region of the heart it tends to moderate its action. But, as has been pointed out by Dujardin-Beaumetz, cold retards and does not promote coagulation, and he is disposed to refer whatever beneficial results have been found to follow these applications either to a contraction of the sac, or rather to inflammation in it caused by the prolonged application of cold. He also calls attention to certain dangers attending these applications, such as diminished vitality of the skin, when external rupture is imminent, and pulmonary congestion and bronchitis from chill. We have ourselves very thoroughly tried the protracted local application of ice to thoracic aneurisms projecting from the chest wall, but beyond a temporary reduction of the frequency of the heart-beat, we have not been able to observe any curative effect.

In the course of aortic aneurism many very painful *symptoms* arise, calling urgently for relief and palliation. The *relief of pain* may require the hypodermic use of morphine and atropine, and the local application of opium or belladonna liniments or plasters. Phenacetin and antipyrin have both been found very useful as analgesics in these cases. Inhalations of chloroform may be needed when pressure on the air-passages causes distressing dyspnœa. We have found small bleedings of value in relieving venous distension and some forms of painful dyspnœa. Tracheotomy or intubation may occasionally be needed, but this operation is only calculated to be of use when the urgent dyspnœa is laryngeal and due to bilateral abductor paralysis; most commonly the dyspnœa is due to pressure on the trachea near its bifurcation, and can only be relieved by anæsthetics. Anginal attacks may be relieved by nitro-glycerine, and barium chloride has also been found most useful for the same purpose in doses of $\frac{1}{10}$th of a grain thrice daily. Great comfort has been derived, in certain situations of the external tumour, from a well-applied elastic support.

ADDITIONAL FORMULÆ.

Pills for arterio-sclerosis with feeble heart.

℞ Sodii iodidi, 1 dram.
Sparteinæ sulph., 15 grains.
Pulv. glycyrrhizæ, q.s.

Ut f. pil. 40. Four to six daily. (To be kept in a dry place.) (*Huchard.*)

Hypodermic injection of ergotin in aneurism.

℞ Ergotin (Bonjean) 40 grains.
Spr. vini rect., 80 minims.
Glycerini, 80 minims.

M. f. solut. Inject three centigrammes under the skin over the tumour. (*Langenbeck.*)

Combination of iodide and bromide in aneurism.

℞ Potassii iodidi, 2 drams.
Sodii bromidi, 2 drams.
Syrupi flor. aurant., 4 drams.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful three times a day. (*Jaccoud.*)

For aneurism.

℞ Potassii iodidi, 3 drams.
Infusi chiratæ, 6 oz.

M. f. mist. A tablespoonful three times a day. (*Balfour.*)

For the cough of aneurism.

℞ Morphinæ hydrochlor., 1 gn.
Acid. hydrochlor. dil., 5 min.
Acid. hydrocyanici dil., $\frac{1}{2}$ drm.
Syrupi scillæ, 1 oz.
Aquæ, 1 oz.

M. f. mist. A teaspoonful occasionally. (*Balfour.*)

Or,

℞ Syrupi scillæ, 2 drams.
Spr. lavand. co., 4 drams.
Tinct. opii ammon., 4 drams.
Syrupi simp., 1 oz.
Aquæ menth. pip., 2 oz.

M. f. mist. A tablespoonful every three hours, and 15 minims of chlorodyne in addition when required. (*Balfour.*)

To relieve the pain and restlessness of aneurismal pressure.

℞ Morphinæ hydrochlor., $\frac{1}{4}$ to $\frac{1}{3}$ grain.
Spir. ætheris sulph. co., $\frac{1}{2}$ dram.
Aquæ menthæ pip. ad 1 oz.

M. f. haust. To be taken occasionally.

To relieve aneurismal neuralgia.

℞ Extr. belladonnæ, 1 dram.
Extr. opii, 1 dram.
Spir. vini rectif., $\frac{1}{2}$ oz.
Glycerini, $\frac{1}{2}$ oz.

M. f. lin. To be applied externally to the painful part.

CHAPTER VII.

THE TREATMENT OF ANÆMIAS.

ANÆMIA : Definition—Some physical Characters of healthy Blood and of Red Blood Corpuscles—Pathological Generalities.

1. *Symptomatic or Secondary Anæmia*—Causation—Symptoms—*Treatment*—(1) Dietetic, (2) Hygienic, (3) Medicinal. Aperients. *Iron*, its various Preparations and Modes of Administration—Natural Chalybeate Waters and Baths—*Manganese*—*Arsenic*—*Oxygen Inhalations.*
2. *Chlorosis.*—Distinctive Characters — Causation — Symptoms—*Treatment.*
3. *Pernicious Anæmia.*—Characters—Blood Changes. *Treatment*—Arsenic, in large Doses—Massage—Diet—Oxygen Inhalations. Additional Formulæ.

BY **anæmia** is meant either a reduction in the whole volume of blood, or a reduction in the number of red corpuscles, or a reduction in its most important albuminous constituent, the *hæmoglobin* or colouring-matter of the corpuscles. It is chiefly a "poverty of the blood in normal functional red corpuscles."

A few facts with regard to the physical characters of the blood, and the life-history of the red corpuscles, had better be stated before we approach the subject of the treatment of the several forms of anæmia.

The specific gravity of healthy blood varies between about 1,040 and 1,070, that of the plasma alone, without the corpuscles, between 1,026 to 1,029. It has a distinctly alkaline reaction. The average size of the red corpuscle is 7·5 μ (micromillimetres) in diameter, and the range in health varies between 6·5 and 9 μ. In embryonic and infantile life the range is greater, viz. from 2·5 to 14 μ. The smaller have been termed *microcysts*, the larger *megalocysts.*

The red corpuscles have no distinct membrane, but consist of a stroma, composed of globulin, coloured with a red pigment, the **hæmoglobin.** This is only loosely combined with the stroma, and can be split up into an albuminate and a red pigment, which is termed *hæmatin.* The depth of colour of the red corpuscles, and their functional activity, depend on the amount of hæmoglobin they contain.

The average number of red corpuscles in healthy blood is 5,000,000 per cubic millimetre, but the number may range between 5,500,000 and 4,000,000.

Nucleated red corpuscles are found, normally, only in the embryo, and it is generally admitted that a nucleated red blood corpuscle is the immediate antecedent of the fully-developed non-nucleated one. The red corpuscles are now believed to originate mainly in the bone marrow, and only to a slight extent in the spleen and lymphatic glands. Observers are not agreed as to the precise manner in which they originate in the marrow, nor as to the part, if any, taken in their formation by the white-blood cells. It is thought that only in the case of exceptional demands on the blood-forming functions is there any formation of red corpuscles in the spleen or lymphatic glands.

The average life of a red blood corpuscle has been estimated at 14 days. The precise manner in which they undergo disintegration is not known. Their destruction would, however, appear to take place chiefly in the portal vessels, and the spleen and gastro-intestinal mucous membrane seem to be the most active seats of blood destruction. The liberated hæmoglobin is carried to the liver, and there converted into pigment. The only other seat of blood destruction, so far as is at present known, is the bone marrow.

To these, the most important points in the physiological characters of the blood, from our present point of view, it will be well to add a few pathological generalities.

In anæmia the serum is often in a *dilute* condition, which would appear to exert an injurious influence on many of the blood corpuscles.

In certain morbid states of the blood there has been noted a tendency to revert towards the embryonic type, of great range of size, in the red corpuscles.

In anæmia the number of red blood corpuscles, and the amount of hæmoglobin contained in them, may vary very greatly: the red corpuscles may be reduced to between 80 to 20 per cent., and the gravity of the case will depend on the amount of the loss. Hayem has reported a case, following puerperal hæmorrhage, in which the number of red blood corpuscles fell as low as 850,000, or only 17 per cent., and the patient recovered.

In ordinary anæmia (as from hæmorrhage) there is an equal reduction in both the number of red corpuscles and the amount of hæmoglobin, and the percentages of loss of corpuscles and of hæmoglobin correspond; but in some forms, as we shall see, there may be a greater relative reduction in the hæmoglobin than in the corpuscles (chlorosis), and in others the relative percentage of hæmoglobin is increased, so that the loss of hæmoglobin is not so great as that of corpuscles (pernicious anæmia).

In anæmia there is no actual or necessary relative increase in the number of leucocytes.

In all forms of anæmia, but especially in the pernicious form, the red corpuscles are apt to become deformed and to present various shapes—ovoid, pyriform, rod-shaped, battledore-shaped, etc., and to this appearance the term *poikilocytosis* has been applied.

Although many of the symptoms and appearances are common to all forms of anæmia, the differences in their course and clinical history are so great that it seems to us best, from a therapeutic point of view, to deal with them under three distinct heads:—

1st. Symptomatic or secondary anæmia.
2nd. Chlorosis . . } The so-called *primary*
3rd. Pernicious anæmia } or idiopathic anæmias.

1. **Symptomatic or secondary anæmia.**—Any disease or injury which leads to *hæmorrhage* must reduce the quantity of the blood and so cause

anæmia; so also any disease which interferes directly or indirectly with the process of blood formation, or is attended with abnormally active blood destruction, must also be attended or followed by anæmia. In hæmorrhagic cases the loss may be rapid and sudden, or gradual and continuous. Successive hæmorrhages, at intervals, are found to be more dangerous than a single hæmorrhage exceeding them in amount, as they interfere more with the regenerating processes. In some cases of large hæmorrhage the regeneration of the blood is very rapid—a week or ten days being adequate to reproduce the normal amount. The corpuscular elements are, however, restored much more slowly than the watery, saline and albuminous constituents, as these are readily absorbed from the gastro-intestinal tract. The hæmoglobin is also restored more slowly than the corpuscles. Besides the direct loss of blood from hæmorrhage, other morbid states may cause a drain on its albuminous constituents, such as chronic suppuration, albuminuria, hyperlactation, rapidly-growing neoplasms, cancer, etc.

Or the defect may lie in the direct or indirect supply of blood-making material to the organism—as inanition from insufficient or unsuitable food-supply; or from assimilative difficulties, as imperfect mastication, œsophageal obstruction, gastric cancer, or chronic dyspeptic states. The plasma, in such cases, is apt to suffer more than the corpuscles.

Or the functions of the assimilative and blood-making organs may be disturbed by acute febrile or chronic wasting diseases, and anæmic states follow the former and accompany the latter—but in such instances the treatment of the anæmia is but a part of the general management of these diseases.

The **symptoms** that may be observed in cases of severe symptomatic anæmia are pallor of the countenance, and especially of the visible mucous membranes; loss of pink colour of the nails; digestive disturbances, such as loss of appetite, vomiting, gastralgia, *constipation;* palpitation and breathlessness on exertion, often with increase of cardiac dulness, owing to dilatation; the presence of murmurs over the heart and large vessels. The dyspnœa is due in part to cardiac feebleness and in part to the deficiency of oxygen-carriers in the blood; some œdema of the feet and ankles often occurs at night and disappears after rest in bed; the nervous system generally presents some signs of irritability, and hysterical manifestations are not uncommon, together with a tendency to neuralgic attacks; in acute anæmia from large hæmorrhages delirium and convulsions may precede fatal coma. Slight pyrexial states may occasionally occur, but they are far more common in the idiopathic forms.

Anæmic states, however caused, are attended with a tendency to hæmorrhage, especially to retinal hæmorrhage, dependent on the extent of the corpuscular loss, especially when this exceeds 50 per cent.

The **treatment** of the anæmic state will be best considered from three points of view: (1) dietetic, (2) hygienic, and (3) medicinal.

1. A defective or unsuitable food supply is one of the most frequent causes of anæmia. With a diet composed exclusively of non-nitrogenous food it has been proved that the percentage of hæmoglobin in the blood undergoes a notable diminution, while it is augmented by a diet rich in albuminates. Defects in this respect will often be found in the dietaries of girls' schools, where anæmic conditions frequently become developed. Growth and development, so exceedingly rapid in girls as the period of puberty approaches, can only take place by the agency and at the expense of the nutrient fluids and their active elements, especially the red corpuscles, and these require a frequent and abundant supply of nutritious food for their constant regeneration. In hæmorrhagic cases recovery is often very rapid with suitable food, and the loss of blood, especially its fluid part, is soon repaired. But not only must we see that there is an adequate and suitable supply of

food, we must also look to its digestion and assimilation. The digestive secretions in these cases are apt to be defective, both in quantity and quality. It has also been noticed that in anæmic persons the conditions of normal metabolism are somewhat modified, and especially that there is increased metabolism of the albuminates with an increased secretion of urea; but the metabolism of fat appears to be diminished, and while their muscles are feeble and wasted they have a plump appearance from the presence of an abundance of adipose tissue; this has been referred to defective oxygenation, due to decrease in the red corpuscles, and consequent imperfect combustion of the hydrocarbons and carbohydrates.

The food should at first be in small or moderate quantity so as not to overtax the feeble digestive powers, and it should be in a readily digestible form. Milk, when easily digested, and cream, and all forms of animal food, presented in a form easy of digestion, are useful. Raw or slightly cooked meat, reduced to pulp, and mixed with a little pleasantly-flavoured *consommé* or broth, is of value as a blood restorer. G. Sée has given as much as 14 oz. of raw meat daily in cases of chlorosis, and this with hydrotherapy he states he has found succeed as a blood restorative after iron has failed. The digestive power for nitrogenous or other foods must be carefully watched, and, if necessary, aided by a few grains of pepsin and a few minims of dilute hydrochloric acid.

Besides animal albuminates, which should predominate in the diet at first, some easily digestible fat, especially if there has been any loss of flesh, should be added; progress in blood-making will often fail to take place until some digestible fat is added to the dietary. A moderate amount of butter or cream, or a dessertspoonful of cod-liver oil daily, may be ordered. The yolk of egg is an easily digested form of food, rich in iron. In anæmia with cardiac feebleness and loss of appetite, the yolks of two or three eggs, beaten up with a little boiling water and flavoured with sugar and some spice, and with a teaspoonful or two of brandy added, is an excellent concentrated form of nourishment.

Bauer remarks "that the reproduction of the most essential components of the blood, especially of the red corpuscles, would be greatly favoured if relatively more albumen were consumed in the food of such patients than is proper under physiological conditions." * Food must be presented to such patients in an attractive and palatable form, especially when there is great indisposition to take food from entire loss of appetite. In such circumstances pleasantly-flavoured fluid or semi-fluid foods, not requiring mastication, must be our chief resource. A certain amount of wine, such as good sound Burgundy, with or without water, will be found useful, both as a stimulant and a sedative; or a glass of porter or stout may sometimes be taken with advantage at bed-time, with a biscuit or some bread and butter.

2. Not less important is attention to the personal *hygiene* or *habits of life* of the patient. One of the most important of these is a life passed much in the open air in a salubrious rural district, or by the sea-side. Free exposure to the vivifying influence of sunlight and good air is one of the best blood restoratives we have. Hence it is that it proves of great advantage to anæmic patients to be able to pass the winter in a climate where it is possible to be much in the open air, for such patients often tolerate badly exposure to cold and inclement weather, and when we advocate a life in the open air, we wish to be understood to mean, under genial climatic conditions. Such patients, we find, are often urged to take more physical exercise than they are able to without injurious fatigue and exhaustion; and at first, at any rate, it is best to restrict them to passive motion through the air, as in driving or sailing, and when some progress has been made in blood regeneration, to gradually encourage walking and riding exercise with a certain

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* "Dietary of the Sick: (Diet in Anæmia and Hydræmia)," p. 275.

limited amount of interesting gymnastics. But with young and *growing* anæmic girls it will generally be found that *enforced rest* will often start an improvement that exercise has failed to bring about, and we often insist on an extra hour or two in bed of a morning, and an hour or two's repose in the afternoon in such cases with the most manifest advantage. Many of these cases, standing as they do on the border-land between pure anæmia and neurasthenia, require somewhat the same management as the latter, and massage and passive movements, together with electrical stimulation of the muscles, may be needed.

The usefulness of baths, and the application of the methods of hydrotherapy to the cure of anæmia have had many advocates, and we are greatly in favour of a judicious use of these methods in cases of anæmia which are found to be making but slow progress towards recovery. The application of douches and affusions to the skin, at first warm and then the temperature gradually reduced, or cold sprinkling of the surface and especially of the spine, following warm affusion, and then brisk friction, is a great stimulant to nutrition and circulation and a calmative to the usually irritable nervous system. Such applications, combined with gentle massage, are of especial value in cases associated with insomnia. Care in diet, a life passed much in the open air, a careful apportionment of rest and exercise, the judicious use of hydrotherapy and massage, the strict limitation of both mental and physical work, the removal of all causes of emotional strain or excitement, and cautious inquiry into and correction of any possible sexual aberrations (for the evil habit of masturbation is a fruitful source of anæmia in both sexes), these are the principal hygienic means for the restoration of a normal blood state.

3. We must in the next place consider the **medicinal** agents which are best calculated to promote blood regeneration. In the first place we will dispose of the question of the value of aperients.

When there is constipation, and this is a very common accompaniment of anæmic states, its removal must occupy the first place in our medicinal management of the case. We have not seen reason to believe, as has been urged, that constipation frequently stands in a causal relationship to anæmia. The cases which we have been accustomed to regard as cases of fæcal intoxication, induced by chronic constipation, we should place in a different category, and indeed we have, in a former chapter, alluded to them; anæmia is certainly present in many of these cases and can only be remedied by remedying the constipation. But we have never yet found those physicians who say they would prefer aperients to iron, in the treatment of anæmia, carry their preference to the extent of prescribing aperients only and withholding iron! Nor do we think if they began this method they would long adhere to it. We say this the more unhesitatingly because we have always advocated and practised the free use of aperients, in conjunction with iron and other remedies, in all cases of anæmia where constipation existed. But not in others. In some cases with irritable bowels, and no tendency to constipation, we have often found a combination of bismuth and iron answer far better than iron alone. The reason why aperients are of such undoubted value, in cases of anæmia with constipation, is obvious. They promote the activity of nutritive changes in a most direct manner, they remove abdominal congestions and quicken the sluggish circulation through the portal and other portions of the vascular system of the alimentary canal, they stimulate the action of the liver and of all the abdominal glands, they thereby increase the quantity and improve the quality of the digestive secretions; at the same time they sweep away any toxic substances which may possibly be formed from retained fæculent matter, and which might be absorbed into the blood; and further, no doubt the excessive development of sulphides from the decomposition of retained fæces leads to the formation of insoluble iron sulphides, and so the iron in the food or that taken as medicine is wasted and lost. We see, then, what important agents aperients are in promoting blood regeneration when chronic constipation is associated with anæmia.

The bowels, then, must be kept adequately relieved, but in very obstinate cases we have found it far better to discard all aperients by the mouth and to trust to long tube enemata of simple water, or soap and water, with abdominal massage. Having succeeded by suitable methods in overcoming the constipation, we should, in our further treatment, take measures to prevent its return, and to maintain the due and regular activity of the bowels; for this purpose it is often a good practice to combine some aperient with such preparations of iron as we may select.

Iron, in the various forms at our disposal, is still, and probably always will be, the chief medicinal remedy for ordinary anæmic states. We are not able to say in what precise manner iron acts as a blood restorative; it has been stated, on experimental grounds, that all the *iron* given by the mouth may be recovered from the fæces; such statements have been received far too readily, and it is difficult to conceive such a series of experimental observations ever having been devised as would justify such a sweeping statement. It is something worse than foolishness to make such inferences from the results observed after injecting iron into the blood-vessels of dogs and rabbits.* As Professors Wood and Shattuck have observed, "the subject of the absorption of iron urgently needs reinvestigation," and we would add by other methods. "Exactly how iron acts," adds Shattuck, "we do not know, but we do know that it is an important constituent of hæmoglobin, and we have the strongest clinical evidences of its usefulness in anæmia, especially in those cases in which the hæmoglobin is relatively more diminished than the number of red corpuscles." It must, of course, be admitted, that in cases of anæmia iron may be absorbed from the food in sufficient quantity to restore the loss of red corpuscles and hæmoglobin, and that therefore an abundance of good food and good air and other hygienic conditions may be attended by recovery, without the use of preparations of iron or even after iron preparations may have failed. But these are exceptional instances, and some of the more severe and more intractable forms of anæmia will be found to arise in the midst of the very best hygienic surroundings, and will only recover when some suitable form of iron is administered and administered for a long period.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 786.

It is well known that it is by no means a matter of indifference what form or preparation of iron is used in different cases of anæmia, and nothing is more common than to find a particular preparation succeed after many others have failed. In the first place we should examine carefully into the state of the digestive functions; if, with a coated tongue, there is loss of appetite, flatulent distension, and other signs of dyspepsia, or chronic gastric catarrh, we must endeavour to improve the digestive functions before we prescribe any form of iron, and some such formula as the following should be ordered :—

℞	Liq. bismuthi citratis	4 drams.
	Sodii bicarb.	2 „
	Spirit. ammoniæ aromat.	3 „
	Tinct. nucis vomicæ	2 „
	Infusi calumbæ	ad 8 oz.

M. f. mist. Two tablespoonfuls an hour before food twice a day. If there is constipation the following pill should be given daily immediately before or after dinner, or supper when dinner is taken at mid-day :—

℞	Aloes extracti	1½ grain.
	Ipecac. pulv.	½ „
	Quininæ sulph.	1 „
	Saponis	½ „

M. f. pil.

After a week or ten days of this treatment, we shall usually be able to begin with one of the milder preparations of iron, and we may then add 5 grains of the ammonio-citrate of iron to each dose of the above mixture, and a grain of ferrous sulphate to each of the pills. Subsequently we may be able to replace the mixture with a modification of Blaud's pills, which we have found most useful. In the modification of this form which we use, we do not attempt, nor desire, to decompose the whole of the ferrous sulphate by potassic carbonate, but to leave an excess of sulphate in the pill; we have no doubt of the superior efficacy of the following formula to that commonly used :—

℞	Ferri sulphatis exsic.	72 grains.
	Potassii carb.	12 ,,
	Pulv. nucis vomicæ	24 ,,
	Saponis	6 ,,

M. et div. in pil. 24. To be coated with a suitable covering. One to three after each meal. In ordinary cases in which, as is the rule, constipation is a prominent symptom, the following modification of a very old formula is one of the most efficacious and rapid blood restorers we are acquainted with :—

℞	Ferri sulphatis	16 grains.
	Acid. sulphurici diluti	40 minims.
	Liq. strychninæ	48 ,,
	Magnesii sulphatis	1 oz.
	Aquæ chloroformi	ad 8 ,,

M. f. mist. Two tablespoonfuls twice or three times a day, an hour before meals.

Some prefer to give the *insoluble* preparations of iron immediately or about an hour after food, in order that they may be dissolved by the gastric juice and so absorbed with the food; and in some cases where there is an intolerance of iron preparations, this is a good plan. The *ferrum redactum* * in 2- or 3-grain doses may be given in pill or powder, or the *ferri carbonas saccharata* in 5- to 10-grain doses in the same manner thrice daily after food.

The best test of the activity of any preparation of iron is now at our service in the method of counting the number of red corpuscles, and of estimating the amount of hæmoglobin during its administration. It is desirable to apply this method of estimating the effect of our remedies on the process of blood regeneration, occasionally, during the treatment.

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* The solubility of reduced iron in gastric juice has been estimated by Quevenne. When 50 centigrammes (7½ grains) of reduced iron were treated with 100 grammes (3 oz.) of gastric juice, 51 milligrammes were dissolved, or about one-tenth.

Many other preparations of iron are of especial value. The ferrum tartaratum and the vinum ferri are useful mild preparations of iron, and the latter is often acceptable to children. The syrup of the phosphate, the compound syrup of the phosphate, and the compound syrup of the hypophosphites are all valuable forms of iron especially useful for children and young growing people. The last-named contains quinine and strychnine and is very useful in the forms of anæmia following acute febrile and inflammatory diseases. The citrate of iron and quinine is also a very useful form in these cases, and is usually easy of digestion.

The syrup of the iodide of iron is particularly valuable in anæmias of scrofulous children with tendency to glandular hypertrophy. Lactates, albuminates, and peptonates of iron have been prepared, and prescribed with a view of presenting the iron in a predigested and readily assimilable form to patients who find a difficulty in digesting other forms of iron. With the same object in view a *syrup of hæmoglobin* has been prepared in France from the blood of animals, and is highly spoken of by Dujardin-Beaumetz; he considers it "one of the most active of ferruginous preparations." The dose of the syrup is 2 or 3 tablespoonfuls a day.

Attempts to administer preparations of iron by the hypodermic method and by rectal injection have been made, but not with any striking success, and it would seem to be necessary, in order to obtain the curative effect of ferruginous preparations, that they should be given by the mouth and utilised in the alimentary canal.

There is one point that must not be lost sight of in the treatment of anæmias by iron, and that is that the first effect of iron is to increase the number of corpuscles without increasing to a corresponding degree the amount of hæmoglobin, that the latter is of slower regeneration and it needs a longer time to re-establish it in the normal amount; we should therefore continue the administration of iron for some time after the regeneration of the corpuscles, and, indeed, for some time after the apparent restoration to health, as relapses are exceedingly common.

Certain inconveniences sometimes attend the administration of iron, but most of them are trivial or avoidable. Constipation is said to be frequently provoked by the presence of iron in the fæces, to which it imparts a black colour, due more probably to the conversion of the iron into sulphide, than into a tannate, as has been suggested, for the black colour has been found even when the diet has been exclusively of milk. We have already insisted on the necessity of combining an aperient with the iron when there is any tendency to constipation. Then it is said to stain the teeth black; this certainly cannot be the case when given in the form of pills, or enclosed in cachets, and very little risk would be incurred in taking the fluid forms of iron if the mouth were well rinsed out with pure water before and after the dose; and by pouring the dose well into the throat there need be little or no contact with the teeth. Gastralgia has also been said to be provoked by preparations of iron, but this is scarcely possible if the preparation selected be a mild one, and the dose given small or moderate. We are aware there is a prevailing belief that large doses are necessary in the treatment of severe forms of anæmia, but we are satisfied that great care in the selection of the preparation, and in its mode of administration, will often avoid the necessity of those large doses, and we shall insist immediately on the activity of very small doses of iron, when given in the form of natural mineral waters. Dujardin-Beaumetz has shown how small is the actual quantity of iron lost by the blood even in the most advanced forms of chlorosis. According to his calculation, in a woman weighing 60 kilogrammes (a little over 9 stones) the amount of iron in the blood does not exceed 2 grammes (30 grains), and the most extreme anæmia does not reduce this amount by more than 50 centigrammes (7½ grains). But we must also bear in mind that the assimilation of iron, and the formation of hæmoglobin are, in such cases, often very slow.

The efficacy of **natural iron waters**, in the treatment of anæmic states, makes it clear that the *form* and not the *quantity* of iron is of chief importance in blood regeneration. It is futile to assert, as some do, that it is the mode of life led at iron spas and not the iron water that is the chief restorative agent, because just the same mode of life can be led at any bracing seaside resort but without the same results. No one with any knowledge of the localities would maintain, that the air and life at Schwalbach were more tonic than at Folkestone, or the air and life at Spa, than at Cromer or Whitby. At St. Moritz, no doubt, a very bracing and stimulating air comes to the aid of the iron cure, but many of the more feeble anæmics bear the St. Moritz cure badly, unless they are prepared for it by three or four weeks at Spa or Schwalbach; then they are enabled to benefit by the more bracing climate of the Engadine, which will otherwise chill and depress them.

At the most celebrated iron spas the iron water is richly charged with free carbonic acid, and the value of an iron spring is greatly dependent on the amount of free carbonic acid it contains. When these waters are exported some of this carbonic acid is necessarily lost, and there is a great tendency in the bottled waters to a deposition of the iron in the form of oxide, which detracts greatly from the value of iron waters except at their source.

Spa, Schwalbach, St. Moritz, Pyrmont, are the best known of chalybeate springs; there are many others, almost as useful, which cannot here be enumerated. Tunbridge Wells has an iron spring, but it contains very little free carbonic acid. At all these Continental spas the water, richly charged with free carbonic acid, is used for baths, and the stimulating effect on the skin and circulation these baths exercise is undoubtedly of efficacy in many cases.

It is rarely thought desirable to prescribe large quantities of these iron waters, one to two glasses (6 oz. each) about two hours after breakfast (11 a.m.)* drunk slowly, slightly warmed if necessary, and at intervals of twenty or thirty minutes, and one or two more about five in the afternoon, is the usual amount, beginning with the smaller and rapidly increasing to the larger quantities.

Since many of the natural iron springs, as those of St. Moritz, contain a considerable amount of salts of lime, they occasionally cause constipation, and this must be guarded against by the use of some aperient water or salts, taken early in the morning. It is remarkable how certain anæmic patients, who do not improve with iron medication at home, appear to assimilate rapidly the iron of these chalybeate springs and quickly recover both tone and colour.

Preparations of *manganese* have been vaunted as blood restoratives, equal in value to those of iron, and many physicians have combined the two, but Professor Hayem maintains, as the outcome of his careful and elaborate researches, that they are not only useless but injurious, as they interfere with the action of the iron salts.

Arsenic we have not found capable of replacing iron in the treatment of ordinary symptomatic anæmias.

Inhalations of oxygen have been advocated in refractory cases, and although they have been shown to have little direct effect in causing regeneration of the blood corpuscles it seems probable that by stimulating the nutritive functions they may favour the assimilation of iron. *Compressed air baths* have also been used with advantage to stimulate the respiratory and nutritive functions, and so to lead, indirectly, to blood regeneration.

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* We believe we were the first to call attention to the injurious effect produced in feeble anæmics by causing them to proceed to the springs early in the morning and drink these waters cold before breakfast, a method which is now almost entirely abandoned.

2. **Chlorosis.**—This disease, which is classed under the *idiopathic* anæmias, differs in some respects from ordinary symptomatic or secondary anæmia; but much that has already been said of the latter, both with regard to symptoms and treatment, applies fully to cases of chlorosis, and we shall only now point out briefly the points in which they are found to differ. *Chlorosis* is almost always a disease of young girls, especially between 14 and 17 years of age. Its causation is doubtful, but it seems often to be associated with sexual disturbances, such as amenorrhœa, dysmenorrhœa, leucorrhœa, and with hysterical states, but these may be sequences and not antecedents of this disease. Lack of exercise and fresh air, emotional disturbances, the absorption of leucomaines and ptomaines from the large intestine as a consequence of habitual constipation, have all been suggested as possible causes.

Hereditary influence has also been invoked. Virchow has gone so far as to attribute it to a developmental defect in the circulatory system, but if that were commonly the case, the transitory and curable nature of the malady would be difficult to understand.

The general symptoms resemble those we have described as common to moderately severe forms of secondary anæmia, the complexion is, however, of a yellowish green colour, and not merely pale, as in anæmia; the skin occasionally shows areas of pigmentation, especially about the joints; the eyes are peculiarly brilliant, and the sclerotics sky-blue. We have already spoken of the breathlessness, palpitations, faintings, cardiac and vascular murmurs, neuralgias, digestive feebleness, constipation, œdema of the feet, which are common to this and the preceding form of anæmia. In chlorosis, especially, the subcutaneous fat is well maintained, and the patients have an aspect of plumpness.

But it is in the characters of the blood that the chief differences are found between this and the other form of anæmia. In chlorosis the red corpuscles may be scarcely at all reduced in number, but they are very poor in hæmoglobin. It is the hæmoglobin which is deficient in this disease, and it may be reduced to from 60 to 30 per cent. of the normal.

In the more severe cases the red corpuscles are also diminished, but the hæmoglobin is always disproportionately reduced. Cases have been observed in which the globular richness was over 85 per cent., and the hæmoglobin only 35 per cent.*

Another character of the blood in chlorosis is the great inequality in the size of the corpuscles; many are much smaller than normal, 3 to 6 μ, and a few are larger. There may be a slight increase of leucocytes. Unlike other forms of anæmia there is little liability to hæmorrhage; optic neuritis is, however, often present. In some cases there is notable **pyrexia,** and in these a great diminution in the corpuscles will be found.

The **treatment** appropriate to these cases is much the same as that already laid down for symptomatic anæmias. In chlorosis it is important to continue the administration of iron for three months or more, as there is a great tendency to relapses; it would seem to be a disease of defective blood formation, and all the medicinal, dietetic, and hygienic measures we have referred to will often be needed to correct this defect. In the febrile cases we should especially see that the bowels are freely evacuated daily, and we may combine quinine or arsenic with the preparation of iron given.

3. **Pernicious anæmia.**—There is a tendency to regard this mysterious and remarkable disease as

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* Osler, "Practice of Medicine," p. 687.

pathologically related to the preceding, but in its clinical features, its course, and its intractableness to almost all forms of treatment, it differs very widely from it. This disease has often been observed to be preceded by symptoms of gastro-intestinal disturbance. or by nervous shock or worry, but it is usually insidious in its approach, and the first deviations from health noticed are languor and pallor of countenance, muscular feebleness and indisposition to exertion. Feelings of faintness and breathlessness with a tendency to palpitations follow. The anæmic aspect is intensified, the visible mucous membranes become pale and the skin assumes a waxy, "faded-leaf," or "lemon" tint, the muscles become flabby, the appetite is lost, and the signs of cardiac and general feebleness become most marked, there is usually œdema of the feet and ankles, "the patient falls into a prostrate and half-torpid state, and at length expires." Pyrexia is common though irregular, the temperature rising to 101°, 102°, or even 104°, but it rarely remains high long. The plumpness of the body is often retained to the last. Gastro-intestinal symptoms, vomiting and diarrhœa are common. The changes found in the blood in this disease are remarkable. Its specific gravity is reduced to 1038 to 1028, its alkalinity is lessened and the solids of the plasma are diminished. The corpuscles no longer adhere in rouleaux, and their number is greatly reduced, often below 30 per cent., and in fatal cases they have been found as low as 7·5 per cent. They also present great variations in form and size (*poikilocytosis*); a large number are above the normal size, 8 to 12 μ; the colouring matter separates readily from the stroma and blood crystals also form readily. Another remarkable point is that the hæmoglobin capacity of the corpuscles is greatly augmented, so that the *percentage of hæmoglobin exceeds that of the corpuscles.* Nucleated red corpuscles are constantly present. Retinal and other hæmorrhages are common. The urine is sometimes, but not always, found of a dark colour, due to the secretion of large quantities of pathological *urobilin* and regarded by some as an evidence of excessive destruction of red blood corpuscles. This disease is supposed to be dependent on excessive blood destruction and defective blood formation, but what it is that causes this remarkable disturbance in the normal life-history of the blood is not known.

Unlike chlorosis, males are more frequently affected than females. The youngest person Osler had seen with this disease was a girl of 20, but cases in much younger subjects have been reported. Also, unlike other forms of anæmia, iron seems to have no remedial effect. *Arsenic*, suggested by Byrom Bramwell, appears to be the only drug that has been employed in the **treatment** of this disease with any good results. It has been given now in a great number of cases, and in many with undoubted benefit. The only difference of opinion which appears to exist as to its remedial effects is whether they are permanent or only temporary. It is usual to give it in the form of Fowler's solution, beginning with doses of 3 minims after food thrice daily, and increasing the dose every 5 or 6 days, first to 5 minims, then to 10, then 15, and finally 20 minims.

These large doses are usually well tolerated. Osler mentions a case in which the dose was gradually increased to 30 minims, and the beneficial effect persisted for nearly three years. When arsenic produces gastric irritation it may be administered hypodermically. It, of course, fails in some cases to produce any good effect, and there are some grounds for believing that many cases reported as recoveries from the use of arsenic have subsequently relapsed; it is certain, however, that cases have remained well for from 2 to 4 years after the arsenic treatment. Its mode of action is at present undetermined, but observations seem to point to its exerting a preservative effect on the blood corpuscles and lessening their vulnerability and disintegration. How it does this is quite unknown. During the commencement of the treatment, at least, the patient should be kept in bed, and massage has been found a useful auxiliary. Free exposure to fresh air and sunshine aid in promoting amelioration. Dr. William Hunter has advocated an exclusively farinaceous diet in these cases as he believes that a nitrogenous diet, in health, causes much greater blood destruction than a farinaceous one, from its greater tendency to excite putrefactive changes in the intestine, and these he thinks may have some causal relation with the increased blood destruction in this disease.

Shattuck * states that in a young male with whom the arsenical treatment seemed to disagree real benefit followed the inhalation of 10 gallons of oxygen thrice daily.

Mackenzie's conclusion in reviewing the treatment of this affection is not very hopeful. He considers the position to-day is but little altered since Addison said of it "that with scarcely a single exception it was in every instance followed, after a variable period, by the same fatal result." †

ADDITIONAL FORMULÆ.

Pills for anæmia.

℞ Ferri et sodii pyrophosph., 30 grains.
Extr. rhei, 45 grains.
Extr. aloes, 8 grains.
Extr. taraxaci, q.s.

Ut f. pil. 50. Two to be taken night and morning. (*Bamberger.*)

Powders for anæmia.

℞ Ferri carbon. saccharat., 15 grains.
Sacchari albi, 75 grains.

M. et divide in pulv. 6. One night and morning. (*Bamberger.*)

Aperient iron pills.

℞ Ferri sulphatis, 20 grains.
Potassii carb., 20 grains.
Myrrhæ pulv., 1 dram.
Aloes socot., ½ dram.

M. et div. in pil. 30. Two or three a day. (*Brandes.*)

Pills for chlorosis.

℞ Ferri ammonio chlorid., ½ dram.
Quininæ sulph., 40 grains.
Pulv. aloes, 20 grains.
Extr. taraxaci, q.s.

Ut f. pil. 60. Four to six daily. (*Frerichs.*)

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* Hare's "System of Practical Therapeutics," vol. ii. p. 790.

† Medical Society's *Transactions*, vol. xiv. p. 212.

Mixture for chlorosis in the nervous and hysterical.

℞ Ferri citratis, 1 dram.
Potassii bromidi, 2½ to 3 drams.
Vini (Malaga), 8 oz.

M. f. mist. A tablespoonful three times a day. (*Siredey.*)

Pills for the same.

℞ Ferri valerianatis, 15 grains.
Castorei, 15 grains.
Extr. rhei, q.s.

Ut f. pil. 20. Two to ten to be taken daily. (*Dujardin-Beaumetz.*)

Mixture for chlorosis.

℞ Ferri sulph., 24 grains.
Magnesii sulph., 6 drams.
Acid. sulph. arom., 1 dram.
Tinct. zingib., 2 drams.
Inf. gent. comp. ad 8 oz.

M. f. mist. A sixth part twice a day. (*Sir A. Clark.*)

Or

℞ Ferri sulphatis, 24 grains.
Sodii bicarb., 2 drams.
Sodii sulphatis, 6 drams.
Tinct. zingib., 2 drams.
Spr. chlorof., 1 dram.
Infus. quassiæ ad 8 oz.

M. f. mist. A sixth part twice a day. (*Sir A. Clark.*)

Pills for anæmia with gastralgia.

℞ Ferri tartarati, 2½ drams.
Extr. gentianæ, 2 drams.
Extr. nucis vom., 4 grains.
Extr. opii, 4 grains.

M. et divide in pil. 100. Two before each meal. (*Huchard.*)

Pastilles of lactate of iron.

℞ Pulv. ferri lactatis, 75 grains
Pulv. sacchari, 3 oz.
"Vanille sugar," 45 grains.
Mucil. tragac., q.s.

M. Divide into 100 pastilles. Two to six daily. (*French Codex.*)

Arsenic and iron mixture for anæmia.

℞ Tinct. ferri perchl., 5 drams.
Liq. arsenicalis, 1 dram.
Glycerini pur., 1 oz.
Aquæ ad 4 oz.

M. f. mist. A teaspoonful three times a day in a wineglassful of water after food. (*Whitla.*)

Quinine and iron mixture.

℞ Tinct. ferri perchlor., 5 drams.
Quininæ sulph., 40 grains.
Glycerini puri, 1 oz.
Aquæ ad 4 oz.

M. f. mist. A teaspoonful in water three times a day after food. (*Whitla.*)

CHAPTER VIII.

THE TREATMENT OF CERTAIN BLOOD DISEASES: LEUKÆMIA — HODGKIN'S DISEASE — ADDISON'S DISEASE—EXOPHTHALMIC GOITRE—MYXŒDEMA.

LEUKÆMIA OR LEUCOCYTHÆMIA. Characters—Symptoms—Course —*Treatment*—Tonics—Arsenic—Phosphorus—Oxygen Inhalations—Excision of Spleen—Douches—Electricity.

HODGKIN'S DISEASE, PSEUDO-LEUKÆMIA, OR LYMPHADENOMA. Characters—*Treatment*—Arsenic—Phosphorus, etc.

ADDISON'S DISEASE: Characters—Symptoms—Indications for Treatment.

EXOPHTHALMIC GOITRE, GRAVES'S OR BASEDOW'S DISEASE. Characters—Course—Symptoms—*Treatment*—(1) Hygienic—Sea and Mountain Air—Hydrotherapy—Diet—(2) Local and Electrical—(3) Medicinal.

MYXŒDEMA: Characters and Nature of Disease—*Treatment*—Thyroid Grafting—Thyroid Extracts—Thyroid Feeding.

Additional Formulæ.

LEUKÆMIA.

Leukæmia or **leucocythæmia** is a mysterious blood disease of the causation and intimate nature of which we have but little precise knowledge. This disease is said to be characterised by a persistent increase of the white blood corpuscles accompanied by considerable enlargement of the spleen, **splenic leukæmia,** and there may also be enlargement of the lymphatic glands and bone marrow. There are rare cases in which the spleen is not enlarged, but the lymphatic glands and bone marrow are affected; these have been termed cases of **lymphatic leukæmia.** As there are few, if any, therapeutic indications to be derived from a consideration of the pathology, so far as it is known, and the symptoms of this disease, we shall briefly describe only the more salient points in its course and features. Of its etiology we may be said to know nothing. It would seem, in a certain proportion of cases, to bear some relation to previous, though often long distant, attacks of ague; but in by far the great majority of cases no such antecedent has been discovered. It is much more common in males than in females, and it is of most frequent occurrence between 20 and 50 years of age.

The enlargement of the spleen may be very great, and may reach from 2 to 18 lbs. in weight.

In *lymphatic leukæmia* the cervical, axillary, mesenteric, inguinal, and other lymphatic glands may be enlarged. The liver is also frequently enlarged. Remarkable changes have been observed in the bone marrow.

The **symptoms** of this disease come on insidiously; progressive abdominal enlargement from splenic hypertrophy, or enlargement of superficial lymphatic glands, is first noticed, accompanied with pallor, dyspnœa, palpitation, and other signs of anæmia. There is a great tendency to hæmorrhage from internal organs, and especially to epistaxis, and retinal hæmorrhages are also common. Gastro-intestinal symptoms, nausea, vomiting, and grave diarrhœa are frequent. As in pernicious anæmia an irregular pyrexia is often observed, and the temperature may rise from time to time as high as 103°, or even higher. Various other symptoms may appear dependent on the defective nutrition of organs, from the altered state of the blood, or from pressure of the splenic tumour. Recovery is rare, and the greater number of cases end fatally in from one to three years.

The diagnosis of this affection must be based on a microscopical examination of the blood; various changes from the normal have been noted in the colourless elements of the blood, but the main point is that the colourless corpuscles are greatly increased in number and the number of red corpuscles much diminished. The average number of white corpuscles per cubic millimetre in health is estimated at about 6,000, or about 1 of white to 500 to 1,000 red; but in this disease the proportion of white to red may be as high as 1 to 10, or 1 to 5, or they may even exceed the red in number!

With regard to the **treatment** of this disease; it has been stated that cases in young children, in whom there has been a great increase in the white corpuscles of the blood, together with splenic enlargement, have recovered during the administration of quinine in large doses (20, 10, and 6 grains daily to a boy of ten) or other tonics, such as cod-liver oil, syrup of the iodide of iron and phosphorus. In purely malarial cases quinine is likely to be of value; but the best results seem to have been derived in this disease, as in pernicious anæmia, from the use of arsenic. Large doses have been given, as much as 20 minims of Fowler's solution three or four times a day, and a great reduction in the proportion of white corpuscles has been registered under this treatment. Osler states that he has repeatedly seen improvement under its use, but, at the same time, points out that there are "curious remissions in this disease which render therapeutical deductions very fallacious." He had seen marked improvement without special treatment in a patient who, "from a bed-ridden wretched condition, recovered strength enough to enable him to attend to light duties." Phosphorus has been given in doses of $\frac{1}{30}$ grain in pills, thrice daily, some have thought with benefit.

Da Costa and others have advocated the use of oxygen inhalations. The former has given 100 gallons daily with benefit. Stieker of Cologne has also reported a marked decrease in the actual and relative number of white corpuscles under the influence of oxygen inhalations, together with a large absolute increase in the red ones. The improvement was not, however, maintained, the spleen continued to increase in size, and the patients succumbed to the disease a few months later. It would have been remarkable if, in the present "surgical age," excision of the leukæmic spleen had not been proposed as a remedy for this disease. This operation has been performed twenty-four times with one recovery! *

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* Osler, "Practice of Medicine," p. 703.

The splenic enlargement has been said to have been reduced by means of cold douches to the left hypochondrium, or by passing a galvanic or faradic current through the hypertrophied organ, the positive pole being placed over the tenth rib and the negative over the enlarged spleen.

In all these cases it is needful to protect the patient from the influence of unfavourable surroundings. He should, when possible, live in an airy, healthy locality by the sea coast, or in the open country in a dry situation; he should have a carefully adapted and well-prepared diet; he should be made as free from mental worries as possible; and he should be protected from all exposure to cold and from the danger of sudden chill. Physical rest with pleasant surroundings is preferable to attempts at active exercise, which tend to rapidly exhaust and enfeeble such patients. As in most incurable maladies, many other remedial agents have been tried, but none, beyond those that have been mentioned, with any notable benefit.

HODGKIN'S DISEASE, PSEUDO-LEUKÆMIA, OR LYMPHADENOMA.

This disease, which is supposed to have some pathological affinity with the preceding, is characterised by a progressive enlargement of the lymphatic glands, together with symptoms of anæmia. Secondary growths of lymphoid tissue have also been found in the liver, spleen, and other organs. The spleen has been found enlarged in three-fourths of the cases, but not to anything like the same extent as in leukæmia. The causation of this affection is as obscure as that of the preceding. It is more prevalent in males than in females, and in young than in old persons. In some cases the glandular enlargements have been thought to be traceable to local irritation (*Trousseau*). The first *symptoms* noticed are usually enlargement of the glands of the neck, axilla, or groin; these are at first distinct and movable, but they tend to fuse together, and may come to form tumours of considerable size. When the deeper-seated glands become affected, as for instance the bronchial and mediastinal glands, serious pressure signs may develop, the chief of which are pains in the chest and dyspnœa, and the symptoms resulting from pressure of the immensely enlarged glands in other situations are often amongst the most serious manifestations of this disease. Progressive anæmia accompanies the glandular enlargements. There is apt to be great variation in the rate of growth and size of the glands. The red blood corpuscles are diminished, and in certain cases the number of leucocytes is greatly increased, bringing this affection into close relationship with splenic leukæmia. As in the latter disease there is a tendency to hæmorrhage, and especially to epistaxis, and the temperature of the body also often rises to 100° to 103° or higher. Curious ague-like paroxysms have been observed in some cases. When cases do not terminate by pressure of the enlarged glands on important structures, the course of the disease is somewhat variable, but with a decided tendency to a fatal termination. Some cases run a rapid course, group after group of glands being successively involved, and death may occur in three or four months ; or periods of quiescence may alternate with periods of activity, and chronic cases may last three or four years. As the fatal event approaches, which is usually from exhaustion, after the development of a cachectic state with progressive anæmia, the glands have, in some instances, been observed to diminish in size and even disappear.

Treatment in cases of this, as in the preceding affection, has not been attended with any great amount of permanent success, and in this disease, as in the other, the strongest testimony is in favour of arsenic.

When the glands are small and localised, removal has been advocated. Arsenic should be given in increasing doses so long as it is well tolerated ; as much as 15 to 20 minims of Fowler's solution thrice daily has been given with advantage for many weeks at a time. Phosphorus has also been given, and a reduction in the size of the glands has been noted during its use. General tonics, such as quinine and the phosphates and iodides of iron, may be given, but more particularly good and supporting food should be carefully provided. Other therapeutic measures have been recommended and adopted, but as they have not been attended by any satisfactory results, it is needless to enumerate them.

ADDISON'S DISEASE.

This is another disease which affords very little scope for therapeutic efforts, as it usually terminates fatally in spite of all remedies that may be applied.

It is usually associated with tuberculous or wasting disease of the suprarenal bodies, or with morbid changes in the abdominal sympathetic nerves and ganglia. We have no definite knowledge of its causation or its pathology, but some cases appear to have followed blows upon the back or abdomen, and others to have been preceded by caries of the spine. This disease is characterised by great asthenia especially affecting the circulatory organs, by gastric irritability, and by a peculiar pigmentation of the skin and some of the mucous membranes, as those of the mouth, conjunctiva, and vagina. Symptoms which may require treatment are nausea, vomiting, diarrhœa, and great cardiac and general feebleness and tendency to syncope. The disease usually ends fatally, and sometimes runs a rapid course terminating in a few weeks. Occasionally it is prolonged for years, and in rare instances recovery appears to have taken place; at any rate long periods of improvement have been observed. The *indications* for **treatment** are chiefly symptomatic; for the gastric irritability, lime water, creasote, oxalate of cerium, hydrocyanic acid, iced champagne, may in turns be required; and for the diarrhœa bismuth and catechu may be prescribed. Iron has been given in full doses with apparently good effect in some cases, and arsenic and strychnine have proved valuable at times. The internal and external use of iodine was suggested by Fagge, but we are not aware that it has been found to be attended with any remedial effects. Alcoholic and other stimulants, such as ammonia and ether, may be needed to ward off attacks of syncope when they threaten.

Good air, and light but nutritious food, are great aids in supporting the patient. Some patients are said to do best on an exclusive milk diet.

EXOPHTHALMIC GOITRE, GRAVES'S DISEASE, BASEDOW'S DISEASE.

It will be convenient to consider in this chapter the treatment of this remarkable affection, which, although often dealt with under diseases of the thyroid gland, is especially marked by circulatory and nervous disturbances.

The three well-known and characteristic signs of this disease are exophthalmos, or prominence of the eyeballs ; enlargement of the thyroid ; and functional excitement of the heart, or palpitation. Its mode of origin is obscure, but it is much more frequent in women than in men, and is most apt to occur between 20 and 30 years of age. Depressing emotions, worry, fright, or nervous shock of some kind have frequently been noticed to precede the onset of this disease, and heredity would appear to have an influence in some cases. The onset of the symptoms is usually gradual, and the disease generally runs a chronic course ; but Osler refers to two rapidly fatal cases occurring in the Philadelphia hospital, one with marked cerebral symptoms, and another in which death occurred from vomiting and diarrhœa, on the third day of the illness. Palpitation is usually the first symptom complained of, with shortness of breath, and the heart's impulse is felt to be greatly increased in force, and all the visible arteries are observed to throb and beat strongly. The heart-beat may vary from 100 to 160, or even more, and it is readily excited by any emotional disturbance. Soft systolic murmurs at the base of the heart are common. The prominence of the eyeballs is early noticeable; at first slight, it may become so considerable that the eyelids cannot close completely, and it has been known to reach such a degree that the eyeball has been dislocated from the orbit. What is known as Von Graefe's sign is that when the eyeball is moved downwards the upper lid does not follow it. There is also sometimes spasm or retraction of the upper lid. The enlargement of the thyroid may be general or it may be limited to one lobe; its vessels are much dilated, and the whole gland is found to pulsate with a thrill. The patients are usually, at the same time, anæmic, emaciated, febrile, and highly nervous. There is often marked muscular tremor. They complain of painful flushing and distressing perspiration. Gastro-intestinal irritation, with vomiting and diarrhœa, is not infrequent, and in grave cases the latter symptoms may prove very intractable. Great irritability of temper and mental depression usually manifest themselves.

Recovery is not uncommon in the milder cases, and is sometimes rapid, but many of the severer forms prove intractable.

This disease is doubtless connected with some nervous lesion; the cervical sympathetic has been pointed to as the seat of injury, and coarse anatomical changes have been described in the lower cervical ganglion. Others refer to the medulla and upper cervical portions of the cord as the more probable seat of the lesion, and we have ourselves given reasons for supposing the emotional centres may be directly or indirectly involved.

In considering the **treatment** of this affection we shall arrange what we have to say under three headings.

1. Hygienic treatment—including change of air, hydrotherapy, and suitable food. 2. Local treatment and especially electrical treatment. 3. Medicinal treatment, including the treatment of symptoms.

1. Change of air and scene, with restful and invigorating surroundings, is of the very greatest importance in the treatment of these cases. In spite of statements to the contrary* we desire to state emphatically that we know of no such remedial influences, in remediable cases of this affection, as a prolonged residence at a suitable seaside resort or a well-selected mountain resort of moderate elevation. We should not recommend patients with this disease to seek, as a rule, an exciting climate like that of the Western Riviera, nor should we recommend them to incur the risks of the frequently chilling air of such elevations as Davos or the Engadine; but in such seaside resorts as Brighton, Westgate, Folkestone, or Biarritz, which present a combination of the sedative and tonic effects of sea-air, or at such moderate elevations as Glion, Sonnenberg, Aussee, or even Engelberg and St. Beatenberg some of the very best results have been obtained; we refer, of course, to the summer season in the mountains. We are supported in our view of the good effect of mountain air by so great an authority as Nothnagel, who considers a "sojourn in mountain regions most important," † and also by Stiller, of Budapest,‡ who has recorded two instances of the successful treatment of Graves's disease with pronounced cardiac failure, by residence at an elevation of 1,000 metres (3,250 feet), about the elevation of Engelberg. Eulenberg also has advocated high altitude sanatoria, but he prefers sub-Alpine ones when dyspnœic symptoms are prominent. Much misapprehension exists as to the effects of such moderate elevations as this on the circulatory organs; in the first place the sedative effect on nervous states which such resorts commonly produce reacts most favourably on the circulatory organs, and the purity and tonic quality of the air have a general

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* Dr. Norris, in Hare's "System of Practical Therapeutics,' vol. ii. p. 851.

† *Medical Press*, Dec. 25, 1889, p. 655.

‡ *Centralblatt für Klin. Med.*, 1888, No. 34, p. 617.

strengthening and restorative effect. In a good season sitting out of doors for many hours in the day is possible, and the moral effect of cheerful surroundings and pleasing scenery is not to be overlooked. Whenever, then, the patient is able to bear the fatigue (and the expense) of removal, either to a suitable sea-coast or mountain resort, this should be the first consideration, and we can assert that it is capable of effecting a cure in many cases without any other treatment.

A modified course of **hydrotherapy** in a good bracing locality has also much to recommend it, and has been found of decided benefit in certain cases. Nothnagel recommends tepid half-baths, irrigations, packing, and the cold spinal bag. Jaccoud advises tepid or warm douches daily for 25 or 30 seconds. After a time their temperature may be reduced until at last they may be given quite cold; but he very properly warns against beginning with *cold* douches, as in these nervous patients they often aggravate the cardiac excitement.

The **diet** should be of a nutritious but bland and unstimulating character. Alcoholic drinks, and tea, coffee, and tobacco should be avoided. Great reliance is placed by some physicians on a milk diet; when the heart is weak some additions may be made to this in the form of pounded meat, or fish, or chicken, or clear soup, and a little red wine in some cases. Whenever disorders of the digestive organs are present, such as gastric catarrh, or diarrhœa, great attention must be paid to the diet, which should consist chiefly of milk and bland farinaceous foods, such as tapioca, sago, arrowroot, and the like.

Much repose in the recumbent position is advisable, but, except in extreme cases, the patient need not be confined to bed, especially if such confinement is felt to be irksome and annoying. All cause of excitement, mental and physical, should be carefully avoided, and everything that is possible should be done to promote a cheerful and hopeful frame of mind.

2. In the next place we must consider the value of local, and especially of **electrical** treatment.

The application of cold to the præcordial region, or over the lower part of the neck, has been found useful in quieting the palpitations by many. Nothnagel uses an ice-bag, and Osler recommends either this or Leiter's tubes. These applications, however, are not unattended with danger, if incautiously employed, and they occasionally cause inflammation, and sloughing of the distended skin over the thyroid.

We would urge that it is necessary, in making such applications, to have particular regard to the hyper-sensitive state of these patients and to consult their feelings, and to watch carefully their effect on the circulation.

A Martin's bandage has been applied round the throat by day and removed by night, to restrain the pulsations of the thyroid; and a compress and bandage have been found useful, applied over the projecting eyeballs during sleep.

Testimony as to the efficiency of local electrical treatment is almost universal. Fagge is almost alone in stating that galvanic treatment has been followed with little advantage. We have ourselves observed it cause great aggravation of all the symptoms in the case of a highly nervous and sensitive patient, but we thought that the electrical specialist in this instance applied far too strong a current.

We also note that in all the cases reputed to have been benefited by this method of treatment it has been applied regularly for *six months ;* now we have observed very remarkable improvement from change of air alone in this period, and the value of this treatment, upon which we do not desire to throw any doubt, must rest on the benefit it confers on patients who cannot, at the same time, avail themselves of suitable change.

Mr. Cardew* has given us one of the best accounts of the application of electrical treatment to the relief of the palpitation and other minor phenomena in this disease, and his method is one which the patient can apply to himself, obviously a very great gain. Mr. Cardew has shown, by sphygmographic tracings, that the immediate effect of the application of the galvanic current according to his method is to lessen the rate, the force, and the suddenness of the ventricular contractions. The feeling of tension in the eyeballs is also relieved. These remedial effects are at first only of short duration, and several applications daily are advisable. The general health also improves, and the tremors, nervous irritability, restlessness, and insomnia disappear; finally the exophthalmos and thyroid enlargement yield. Mr. Cardew insists that this treatment, the duration of which must vary with the severity of the case, should be continued for a few weeks after recovery, as relapses are apt to occur. The great advantage of this method we consider to be its mildness and painlessness, so that the patient's nervous dread of electrical applications is at once removed. Mr. Cardew uses a very weak continuous galvanic current (2 to 3 milliamperes), and has it applied, for six minutes, three times a day. The positive electrode (a circular disc of ductile metal three inches in diameter) is placed on the nape of the neck, so that the centre of its lower border corresponds to the spine of the seventh cervical vertebra. In that position it is held during the application. The negative electrode (a similar disc, an inch and a half in diameter) is moved up and down the anterior border of the sterno-mastoid, being applied to the right and left sides of the neck respectively on alternate occasions. The electrodes are covered with washleather saturated with hot water. The battery should have an electromotive force of about 6 volts. The dry cells are the most convenient; these should be connected in series and placed in a box, their end terminals being connected to two terminal screws, marked respectively + and —. A water voltameter enables the patient to ascertain if his battery is in proper working order.

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* *Lancet*, July 4 and 11, 1891.

Nothnagel advises galvanism through the medulla and the cervical sympathetic. Charcot recommends the faradic current to be applied to the eyelids, the thyroid, and the cardiac region. Osler admits that many cases have derived temporary improvement from the use of the galvanic current, the cathode being placed at the back of the neck, and the anode along the course of the sympathetic or over the heart. Jaccoud considers the best form of electricity to employ is bilateral galvanism of the neck, daily, by means of weak continuous ascending currents.

3. We now come to the question of **medicinal** treatment, and here we encounter, as might be expected, great diversity of opinion. We agree with Nothnagel in believing that medicines "are of little use" as direct curative agents, but we believe that as auxiliaries and for the relief of symptomatic conditions suitable medicines will be found of very great value. Fagge asserts that iron seldom or never does good, and that digitalis has no power in tranquillising the heart. Osler, on the other hand, advises a combination of digitalis and iron when there is marked anæmia, and Nothnagel commends a combination of iron and bromides. We have frequently given iron in combination with potassium or sodium bromide with very great advantage in the milder forms of this disease, associated with anæmia in young women. We always use a mild preparation of iron, generally the ammonio-citrate, and we give five to ten grains of this thrice daily with ten grains of potassium bromide, with the effect of benefiting the anæmia and quieting the nervous excitement and lessening palpitation. Digitalis we have found a "two-edged sword,"—in some cases it will quiet the action of the heart and reduce the pulse-rate, but in others it seems to increase the cardiac excitement and to make matters worse, and its tendency to cause gastric irritation is more manifest in this disease than in any other. On the whole, we

think it should not be commonly prescribed in this disease. Several trustworthy observers testify that strophanthus quiets the cardiac action and is of real service in this malady; five minims may be given three times a day. Friedreich advises the continued use of quinine; we agree with Jaccoud that it often fails to agree with these patients. Arsenious acid is a favourite remedy of Jaccoud; he gives $\frac{1}{32}$ grain, twice a day, with the food, and increases the dose, with intermissions, up to $\frac{1}{16}$ grain. He also gives potassium bromide, 30 to 60 grains, daily. Besides the bromides, which are very useful in allaying the troublesome nervous symptoms and insomnia, we have also found valerianate of zinc, a grain three times a day, valuable for the same purpose.

Belladonna has a certain amount of testimony in its favour, and made into a collodion it has been painted over the thyroid enlargement. We do not advise the use of such depressors of cardiac force as aconite and veratrum viride, recommended by some authorities; the cardiac force does not need depression, but regulation.

The gastro-intestinal troubles may require the exhibition of bismuth, hydrocyanic acid, and alkalies; the diarrhœa in the later stages of this disease often becomes most intractable, and may require the use of opiate enemata—ten grains of Dover's powder and 20 grains of tannin mixed with two ounces of starch may be thrown into the bowel twice a day if necessary. We have found the tincture of coto, in 10- to 20-minim doses, mixed with a dram of compound tincture of cardamoms, a dram of mucilage, and an ounce of chloroform water, one of the best internal remedies for this symptom. The use of the aromatic sulphuric acid, in 20-minim doses, three times a day, has been found to give very good results.

In extremely violent attacks of palpitation, jeopardising life, which have been reported, but which we have not witnessed, various expedients have been suggested, such as venesection, the free use of ether, and other stimulants, the ice-bag to the heart, inhalations of nitrite of amyl and hypodermic administration of morphia and atropine, but we are not aware that any experience of these remedies, in such circumstances, is on record.

MYXŒDEMA.

This singular disease, to which attention has only of late years been directed, mainly through the observations of Gull and Ord, seems to be dependent on a morbid condition of the thyroid body, and to be pathologically related to those cases of sporadic cretinism in which there is a congenital absence of that gland.

The disease to which we are now referring was described by Sir William Gull as "a cretinoid state supervening in adult life in women." Ord and many other observers have investigated and fully described this affection, and have shown that it is not restricted to women, although they are far more frequently affected with it than men.

The mode of origin of this disease is obscure, but it has been referred to mental anxiety and distress. The anatomical condition appears to be wasting or degeneration of the thyroid gland. It may be much diminished in size, or it may be completely atrophied and converted into a fibroid mass. The presence of an enlarged thyroid is not, however, inconsistent with the manifestations of this disease, as, although enlarged in size, the gland may, functionally, have undergone degenerative changes. The chief symptoms and clinical features of this disease are the following:—Great loss of muscular energy, so that the patient's movements become remarkably feeble and slow, and his gait unsteady and "swaggering," his speech also becomes slow and deliberate, and sometimes indistinct, and the tongue is thick and swollen : mental operations are also slow and flagging. The face has a peculiar and characteristic appearance. It is swollen and expressionless ; the complexion has a waxy aspect, and there is a bright red spot on each cheek caused by dilatation of veins and capillaries; the alæ of the nose are thickened and the nose itself is flattened and spread out; the lips are thickened, swollen, and often cyanosed; the eyelids are also swollen, baggy or puffy, and transparent, but on puncture no fluid exudes; the eyelashes and eyebrows often disappear, and the hair disappears also from the axillæ and pubes and in part from the head, so that the patient may be nearly bald. The body generally increases in size and weight and the abdomen becomes protuberant. The hands are notably swollen, clumsy and "spade-like," their backs are especially so, the fingers are thick and sensation is defective. The "œdema" is *solid* and does not pit on pressure. There is further a peculiar swelling of the subcutaneous tissues in the supraclavicular regions. The skin is observed to be very dry and rough and the patient rarely or never perspires. The circulation is languid, the pulse slow and feeble, and the heart-sounds weak. The temperature is usually sub-normal. Albuminuria is sometimes present.

The clinical study of this disease, and especially the successful efforts that have lately been made in several quarters to deal with it therapeutically, have thrown much light on the functions of the thyroid body, and have raised, if we may use the expression, the physiological rank of that organ. It is clear, from the results observed to follow disease of this gland, as well as from those following its removal in men and animals, as reported especially by Kocher of Berne and Horsley in England, that it elaborates, normally, some secretion which passes into the general circulation and exerts there an important influence in tissue metabolism.

The limited space at our disposal renders it necessary that we should deal very briefly with the therapeutic measures that have been applied to the amelioration and cure of the myxœdematous state. At first the application of hot baths and keeping the body warm and well protected from chill, and promoting the action of the skin by the exhibition of jaborandi, was all that seemed clearly indicated, and some improvement in the symptoms and general condition had been observed by Ord and others as the result of this treatment. But far better results are now attainable by the adoption of what is quite a new departure in therapeutics, and one which may possibly lead to much future progress.

Thyroid grafting has been practised with good results in *cachexia strumipriva*, in *sporadic cretinism*, and in *myxœdema*, by Kocher, Horsley, Bircher, and by Gibson of Brisbane. In a case of sporadic cretinism recently and fully reported by the last-named,* the grafting was done by removing both lobes of an etherised lamb's thyroid, incising them longitudinally and introducing them (1) within the sheath of the pectoral muscle, and (2) on another occasion into the child's abdomen. The improvement in the child's condition which followed was most remarkable. Murray, of Newcastle, was one of the first to introduce the use of an **extract** of the **thyroid glands** of sheep, injected hypodermically, in the treatment of myxœdema, with most remarkable results.†

"For the injections," he says, "an extract of the thyroid gland of a sheep has been prepared freshly for me each week by Messrs. Brady and Martin, of Newcastle, in the following manner: The thyroid glands are removed from several sheep just after they have been killed. Each lobe is minced and then bruised in a mortar. For each lobe employed 1 c.c. of glycerine and 1 c.c. of a 0·5 per cent. solution of carbolic acid in boiled distilled water is added. The mixture is allowed to stand for twelve hours, and then squeezed through a cloth in a press so as to obtain as much liquid as possible from the mixture. All the apparatus used in the preparation is previously cleansed by boiling water and 1 in 20 carbolic acid solution. In future the manufacturers are going to sterilise the extract by pressure at ordinary temperatures by means of the liquefied carbonic acid apparatus used by M. d'Arsonval."

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* *British Medical Journal*, January 14th, 1893.

† *British Medical Journal*, August 27th, 1892.

The doses of this extract have varied between 10 and 25 minims, injected slowly beneath the skin of the intrascapular region,—the larger doses once a week, the smaller ones more frequently. It must be borne in mind that the too rapid introduction of the thyroid extract into the blood, or its introduction in too large quantity at a time, is unsafe and apt to be attended by unpleasant phenomena, such as flushing, nausea, lumbar pains, and even loss of consciousness and tonic muscular spasms have been induced. There is also another important caution to be kept in view, and that is that such patients must not be allowed to return too soon to their former mode of life, after their apparent cure, for in some the cardiac muscle remains very feeble, and sudden death from cardiac failure has been noted in some patients on making efforts to which they have long been unaccustomed. Of course this kind of treatment, which has for its object to supply the defective thyroid secretion, must in most cases be more or less continuous, and on its entire discontinuance relapses must be expected. We must also be on our guard against the production of septic abscesses at the seat of injection; this may generally be obviated by seeing that the extract is sterilised and strict aseptic precautions taken.

Mr. White, the pharmaceutist to St. Thomas's Hospital, has succeeded in preparing "a dry, stable preparation" from the sheep's thyroid in the following manner:—"The glands were first exhausted with a mixture of equal parts of glycerine and water. The filtered fluid was then acidulated with phosphoric acid, and calcium hydrate added until an alkaline reaction was obtained. The precipitate was filtered out as rapidly as possible, washed, and dried over sulphuric acid without heat. The powder obtained in this manner is the substance employed successfully by Dr. Davies in the treatment of the cases exhibited by him at the Clinical Society of London. The dose given was 3 grains, corresponding to one-eighth of a gland, and of this about one grain was organic matter, which I propose to investigate more closely. Recently I have been making 3 grains equivalent to one-sixth of a gland."

Hector Mackenzie, Holman, and others have given the fresh thyroid glands themselves, or extracts from them, *by the mouth*, and observed a general amelioration of all the symptoms. If this plan proves as effectual as the other it presents obvious conveniences in a method of treatment that is to be so prolonged or continuous. A half a sheep's thyroid appears to be a suitable dose; it must be eaten raw, and in Dr. Holman's case, the thyroid of a sheep slaughtered two or three hours before, was "finely minced with sharp scissors in the glass from which the patient drank it after the addition of a little brandy and water."

The results of this mode of treatment may be thus summarised: The swelling diminishes and the natural expression of the face returns, the skin becomes moist and the patient is again able to perspire freely. New hair grows on the head; the sub-normal temperatures approach the normal. The hands and the rest of the body become smaller, and there is often a considerable loss of weight. The mental and bodily activity are to a great extent restored. Increased diuresis seems to be common.

ADDITIONAL FORMULÆ.

For lymphadenoma.

℞ Liquor. arsenicalis, 2 drams.
Tinct. ferri malat., 2 drams.

M. Ten to fifteen drops before each meal. (*Billroth.*)

(He recommends also subcutaneous injections into the enlarged glands of two to three drops of Fowler's solution.)

For exophthalmic goitre.

℞ Ferri redacti, 2 grains.

Tinct. aconiti, 1 minim.

Pulv. acaciæ, q.s.

Ut f. pil. To be taken three times a day. (*Austin Flint.*)

For exophthalmic goitre.

℞ Ferri carb. sacchar., 20 grains.
Quininæ sulphatis, 30 grains.
Extr. et pulv. glycyrrhizæ, q.s.

Ut f. pil. 30. Three to be taken daily after meals. (*Benedikt.*)

For the same.

℞ Pulv. ipecac., $\frac{1}{3}$ grain.
Pulv. fol. digitalis, $\frac{1}{3}$ grain.
Extr. opii., $\frac{1}{6}$ grain.

M. f. pil. Four to six to be taken daily. (*Dieulafoy.*)

For diarrhœa in oxophthalmic goitre.

℞ Tinct. cotonis, 1 dram.
Tinct. chloroformi comp., 3 drams.
Spr. ammon. arom., 2 drams.
Mucilaginis acaciæ, 4 drams.
Syrupi zingib., 4 drams.
Aquæ cinnam. ad 6 oz.

M. f. mist. A tablespoonful for a dose. (The tincture of coto must be rubbed up carefully with the syrup and mucilage.)

For exophthalmic goitre.

℞ Tinct. ferri acetatis æther., 1 to 2 drams.
Potassii iodid., 2 drams.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful three times a day; also frictions with iodine ointment. (*Lentovsky.*)

Iron and bromide mixture for the same.

℞ Ferri et ammon. citratis, 40 grains.
Sodii bromidi, 80 grains.
Spr. ammon. arom., 2 drams.
Aquæ ad 8 oz.

M. f. mist. Two tablespoonfuls twice a day.

Pills for the same.

Nervous form.

℞ Zinci valerianatis, 20 grains.
Extr. belladonnæ, 4 grains.

M. et divide in pil. 20. One twice or thrice daily.

Part III.

DISEASES OF THE ORGANS OF RESPIRATION.

CHAPTER I.

THE TREATMENT OF CATARRHAL AFFECTIONS OF THE RESPIRATORY ORGANS: ACUTE AND CHRONIC NASAL AND LARYNGEAL CATARRHS.

Acute Nasal Catarrh or Coryza.—Causes: Predisposition—Chill—Dust—Symptoms—Treatment: (*a*) Prophylactic—(*b*) General—Preparations of Opium and Morphine—Quinine—Salicine—Aconite—Belladonna—Camphor—The "Dry" Cure—(*c*) Local—Inhalations—Sprays—Insufflations. Chronic Nasal Catarrh.—Astringent Snuffs and Injections—Alkaline Injections—*Ozæna* or *Atrophic Rhinitis*—Obscurity of its Nature and Cause. Treatment: Indications—Cleansing Douches—Formulæ—Antiseptic and Deodorising Paints—Sprays—Injections—Bougies and Insufflations—Formulæ. Acute Laryngeal Catarrh.—Causes resemble those of Acute Nasal Catarrh—Symptoms—Treatment: Codeia or Morphine—Alkaline Drinks or Mixtures—Counter-irritation—Cold Compresses—Cocaine—Inhalations—Severe Dyspnœic Form in Children—Leeches—Emetics—Scarification—Tracheotomy—Sedatives and Expectorants. Chronic Laryngeal Catarrh.—Causes—Symptoms—Treatment: Mineral Waters—Local Applications—Inhalations—Insufflations—Sprays—Massage—Climate. Additional Formulæ.

Acute Nasal Catarrh or Coryza.

The phenomena attending an attack of acute nasal catarrh, coryza, or "cold in the head," are so familiar as to scarcely need description. The disease is interesting and instructive, however, as a type of catarrhal affections generally, since the inflamed mucous membrane is, in this case, accessible to view.

The **causes** of acute nasal catarrh are the same as those of other catarrhal affections of the air-passages, viz. exposure to some local irritant, or to chill of the surface of the body, or to rapid changes of temperature; but exposure to these exciting causes does not necessarily produce this disease, unless a predisposition "to take cold" exists in the individual. This constitutional predisposition is very marked in many persons, and is not easily accounted for.

There would seem to be in certain persons a peculiar sensitiveness of particular tracts of mucous membrane to particular irritants. It would also seem that catarrhs of the nasal and other mucous membranes are the result often of *reflex* rather than of *direct* irritation. A current of cold air falling on the head or face, or some other part of the body, will, in predisposed persons, give rise to an attack of acute nasal catarrh.

Dust (or infective organisms in the dust) is another frequent cause, especially the foul dust of the streets blown about by a cold east wind.

The terms "*hay fever*" and "*rose cold*" refer to the well-known fact that the emanations from certain plants are capable of exciting intense nasal catarrh in some persons.

The physical changes which are observable in the nasal mucous membrane when affected by an acute catarrh are these:—The membrane is more or less red and swollen, so much so, sometimes, as to completely block up the nasal passages; the swelling is due to dilatation and congestion of the blood-vessels and exudation into the tissue of the mucous membrane. At first the surface is dry, but soon the fluid exudation is so considerable that it flows away from the surface as a colourless, thin, saltish fluid, often very irritating to the orifices of the nose and the adjacent skin of the lips. Later the swelling and congestion diminish, and the discharge becomes thicker and less transparent from the presence of abundance of young cells.

The **symptoms** accompanying this condition are, first, a sense of dryness and stuffiness in the nose, with a great desire to blow the nose—to "clear it"—which should be resisted as much as possible;

sometimes there is a tickling feeling with an irresistible tendency to sneeze; the feeling of dryness is soon succeeded by the flow of fluid just described, which may become so distressingly abundant that a patient's rest at night will be completely destroyed by the necessity of constantly wiping away the secretion.

There is usually a smarting, painful feeling about the forehead and eyes due to the extension of the catarrhal inflammation to the conjunctivæ and the frontal sinuses: sometimes it extends to the fauces, and causes pain in swallowing, or into the larynx, and gives rise to an irritable cough, or along the Eustachian tube, causing some pain and noises in the ears, and slight temporary deafness. With some persons there is usually a certain amount of fever present, with quickened pulse, slight rise of temperature, thirst, high-coloured urine, chilliness, and aching of the limbs. With careful treatment this disease usually disappears in from three to eight days, but if neglected it may terminate in chronic catarrh, which may extend to the larynx, or even to the bronchial tubes.

The **treatment** of acute nasal catarrh may be conveniently considered under three heads:—(*a*) Prophylactic; (*b*) general; and (*c*) local.

(*a*) *Prophylactic treatment.*—The predisposition to suffer repeatedly from attacks of coryza may be greatly diminished by suitable prophylactic measures. The most important of these is the adoption of some hardening process which shall have for its object the removal or diminution of a certain hyper-sensitiveness of the skin and mucous membranes which characterises such patients.

Avoidance of sedentary habits and free exercise in the open air are of great value. Cold affusion over the head and neck, begun in warm weather and steadily maintained throughout the whole year, is of undoubted efficacy. The use of the *shower-bath* for this purpose has been strongly advocated, but there are not many persons who can tolerate a cold shower-bath all the year round, but most persons can bear two or three large spongefuls of cold water wrung out over the head and neck on first rising in the morning.

This process imparts contractile tone to the superficial vessels and counteracts the tendency to vascular asthenia, upon which catarrhal conditions mainly depend.

A tendency to nasal catarrh and to other catarrhal states is excited and maintained by residence in low-lying, damp, cold situations; and it is hopeless to endeavour to relieve, permanently, such conditions while the subjects of them continue to dwell in these localities. It follows that one of the best prophylactic measures against attacks of nasal catarrh is residence in a dry, bracing locality.

Removal for a season to the dry, cold, bracing climate of the Engadine, or some similar resort, is of especial value in lessening the morbid sensitiveness of the surface, so far as it tends to the production of catarrh of the respiratory tracts.

Next in value to mountain air is well-directed sea bathing, during the summer months, associated with abundant exposure to the open air of the seaside. Such patients should not be allowed to remain long in the sea at a time; it is better they should make repeated plunges, for it is the bracing shock to the surface that is required, not the continued contact of the cold sea-water. Persons who suffer from summer catarrh, or "hay fever," are often immediately relieved on removal to the sea coast.

This treatment of combined sea-bathing and sea-air is also of the greatest value in the chronic nasal catarrh of scrofulous subjects, a most obstinate malady, and one difficult to cure.

(*b*) Of *general* remedies diaphoretics are undoubtedly most useful, and one of the most effectual of these is **opium.** It acts best when combined with other diaphoretics. If it fails to cure the cold, it, at any rate, relieves the most distressing symptoms.

Opium undoubtedly exercises a remarkable effect upon the capillary circulation in the respiratory mucous membranes, but it is by no means a matter of indifference what method is adopted in administering the opium.

When the cold is quite in its initial stage, when the nasal mucous membrane is only a little swollen and dry, and there is an uneasy feeling over the frontal sinuses, and before the occurrence of any great amount of fluxion, the following is perhaps the best method:—

Supposing the patient to have had a good meal in the middle of the day, no more solid food should be taken that day, but about three or four hours before bed-time a pill of $\frac{1}{8}$ of a grain of acetate or sulphate of morphine should be taken with a small cup of weak tea; and at bed-time another $\frac{1}{8}$ of a grain with a wine-glassful of whisky and water.

This measure alone will constantly arrest a cold in the head if adopted in the initial stage. If it fails, it fails from want of attention to small details. It makes all the difference whether this small dose of morphine be taken when the stomach is full or empty, whether it be absorbed into the blood in a few minutes, or whether it be mixed with a mass of food and absorbed slowly. The result in the two cases is wholly different. In the first case you have a definite quantity of the remedy immediately absorbed into the blood; in the second, the remedy is slowly absorbed in indefinite quantity, and there is no reason why some of it should not pass out of the body in the residue of the food.

If the dry initial stage is passed, and the nasal fluxion is thoroughly established with a distressing feeling of oppression and stuffiness about the nasal passages and frontal sinuses, the following diaphoretic draught, containing opium, is of the greatest use:

℞	Liquor. opii sedat.	... 10 to 15 minims.
	Vini ipecac.	... 5 minims.
	Spr. ætheris nitrosi ...	... 1 dram.
	Liq. ammonii acet. ...	... 3 drams.
	Aquæ camphoræ ...	ad $1\frac{1}{2}$ oz.

M. f. haust. To be taken at bed-time.

If the patient is able to remain in the house, or, better still, in a moderately warm room for a day or two, a single dose of this kind will not infrequently remove all the catarrhal symptoms permanently as well as immediately. But although it will surely give immediate relief, yet, if the patient exposes himself to changes of temperature, the next morning the catarrhal condition will frequently return.

But even these small doses of morphine or opium are not well borne by some persons; the use of these drugs, in some patients, is usually followed by nausea, a furred tongue, dark-coloured urine, pale, clay-coloured stools, and a feeling of general *malaise.* These are persons commonly known as "bilious." The functions of their liver cells are easily inhibited for a time, especially by opium. In such cases it is best to avoid opium altogether, and give other diaphoretics, such as two tablespoonfuls of the following mixture every four or five hours:—

℞ Spiritus ætheris nitrosi	4 drams.
Liquoris ammonii acetatis	2 oz.
Potassii bicarb.	40 grains.
Vini ipecacuanhæ	40 minims.
Aquæ camphoræ	ad 8 oz.

M. f. mist.

This is also a useful mixture for young children, in doses varying from two teaspoonfuls to a tablespoonful.

Sometimes a combination of camphor and a small dose of morphine acts well, as in the following draught:

℞ Liq. morphinæ acetatis	15 minims.
Spiritus camphoræ	10 ,,
Mucilaginis	1 dram.
Aquæ	ad 1½ oz.

M. f. haust. To be taken at bed-time.

Persons who do not bear opium well should always be given a saline aperient the morning after a draught of this kind, such as one or two teaspoonfuls of Carlsbad salts.

After the first twenty-four hours, or even sooner, it is often advantageous to give some **quinine**, especially when there is feverishness and a feeling of depression. It is best given in an effervescing saline mixture as follows:

℞ Potassii bicarb.	āā 1 dram.
Sodii bicarb.	
Ammonii carbonatis	½ ,,
Syrupi aurantii	½ oz.
Aquæ	ad 8 oz.

M. f. mist.

℞ Quininæ sulph.	12 grains.
Acidi citrici	2 drams.
Sacchari lactis	1 dram.

Mix and divide into six powders. One of the powders, dissolved in water and mixed with a sixth part of the mixture, to be taken three times a day.

In some persons, especially if there is much aching of the limbs and *general* discomfort, great benefit is often derived from *beginning* the treatment with a draught at bed-time containing *salicin* as follows:

℞ Salicinæ	15 grains.
Potassii bicarb.	20 ,,
Spr. ætheris nitrosi	½ dram.
Liquor. ammonii acetatis	3 drams.
Aquæ camphoræ	ad 1½ oz.

M. f. haust.

This should be followed by the quinine mixture just mentioned.

In children and young people, when an attack of coryza is attended, as it often is, with decided feverishness, and particularly if the throat is involved and its mucous membrane is found red and swollen, great benefit will follow the administration of a few doses of **aconite.** Indeed, aconite will be found most valuable in all the ephemeral and symptomatic fevers of children and young people. A convenient form is

Schiefflin's pilules of Duquesnil's aconitine $\frac{1}{480}$ grain in each. One of these should be given every two hours for three doses, or 1 to 3 minims of the tincture of aconite (according to the age of the patient). As a rule, aconite is a drug that produces an *immediately* beneficial effect or it is of no value; it is therefore of much use in the *initial* stage of febrile maladies, but of little use in the advanced stage. It is a drug, therefore, which should never be given in large doses with the view of obtaining better effects than from small or moderate ones, nor should it be persevered in when it fails to afford immediate relief.

In some persons, when the catarrh is associated with redness of the fauces, and discomfort in swallowing from implication of the pharynx, you will find *belladonna* a valuable remedy. But if the catarrh extends to the larynx the drying effect of belladonna on the mucous membrane will, in some persons, aggravate the laryngeal irritation, and a painful and ineffectual cough is set up, owing to the difficulty in getting rid of small portions of dryish mucus which collects in the larynx.

The following is a useful combination in cases where belladonna is indicated:

℞ Tincturæ belladonnæ	40 minims.
Potassii chloratis	40 grains.
Syrupi limonis	3 drams.
Aquæ	ad 2 oz.

M. f. mist. Two teaspoonfuls to be taken every hour until relieved.

Camphor is a popular remedy for coryza; a few drops of the spirit of camphor, dropped on sugar, or taken in water, every half hour, will in certain persons arrest a cold in the head, if taken in the initial stage; but it is not to be compared in efficacy with opium or morphia, given in the manner enjoined.

What is called the "dry" cure consists in stopping the supplies of all liquids; and so, by not adding any water to the blood, while the system withdraws from the blood the fluid required for the natural secretions, the quantity of fluid in the blood-vessels is diminished and the local hyperæmia thereby lessened. The catarrh ceases because the supply of fluid to the blood is cut off. The amount of fluid permitted is a table-spoonful of milk or tea with the morning and evening meals, and a wine-glassful of water at bed-time. But this has never been a popular method—the remedy appearing to many persons worse than the disease !

(*c*) Lastly, we have to consider the action of *remedies applied locally.*

A common and popular method of attempting to cut short an attack of coryza is to inhale the vapours given off by a mixture of ammonia, carbolic acid, and rectified spirit :

℞ Liq. ammonii fort.	1 dram.
Spr. vini rect.	2 drams.
Acidi carbolici	1 dram.
Aquæ	2 drams.

M.

This mixture is dropped upon some absorbent substance, and the vapour is inhaled by the nostrils.

The following is also an excellent inhalation (dry) in the earliest stage of nasal catarrh ; it can be inhaled from the bottle in which it is contained :

℞ Pinol	2 drams.
Camphoræ	40 grains.
Liquor. ammoniæ fort.	1 dram.
Spiritus rectificat.	1 oz.

M. f. inhalatio.

Another method of inhaling *camphor*, which has been recommended as exceedingly efficacious, is the following : A teaspoonful of powdered camphor is put into a quart jug, and this is half filled with boiling water. A cone of paper is placed over the jug, and at the apex an opening is made to admit the nose. In this way the aqueous vapour charged with camphor is respired from five to ten minutes. The vapours are somewhat irritating to the nose and pharynx, but if one has the endurance to continue with the inhalation for the necessary length of time, we are assured that the most obstinate nasal catarrh will yield to at most three applications.

The inhalation of the vapour of **menthol** we have found the most useful of all in recent nasal catarrh.

When there is much distress from swelling and dryness of the nasal mucous membrane, relief may be obtained by the inhalation of moist soothing vapours; the vapour of hot water, or of infusion of camomile, or of elder-flowers, or of the decoction of poppy heads. These vapours may be inhaled from the orifice of a narrow-mouthed jug, which together with the mouth and nose of the patient are covered with a towel, or they may be conducted directly to the nostrils by an indiarubber tube connected with the steam-generating apparatus.

When the secretion is profuse and the nostrils feel blocked up, benefit is sometimes obtained by the application of a warm spray of a weak solution of common salt or sodium bicarbonate (2 to 6 grains to the ounce), or Ems water, for a quarter of an hour at a time, four or five times a day.

Brushing the nasal mucous membrane with glycerine has been found useful.

Some have strongly recommended the snuffing up of a powder composed of bismuth, tragacanth powder and morphine, in the early stage of nasal catarrh. But many persons object strongly to the introduction of a sticky powder into the nostrils.

Relief to the sense of distressing fulness may often be obtained by applying pledgets of cotton-wool soaked in a 4 per cent. solution of cocaine, or by inhaling menthol dissolved in chloroform, a few drops at a time. The excessive secretion may be checked by injections of hazeline.

The recurrent form of nasal catarrh will often yield to change of air—from the town to the sea-side; when this is not practicable small doses of arsenious acid ($\frac{1}{60}$ grain) twice or three times a day prove useful.

Chronic Nasal Catarrh. Ozæna.

Many chronic forms of nasal catarrh are associated with structural changes in the nasal passages, and are only amenable to special surgical treatment, and. therefore, do not concern us here. Other forms are perhaps better termed *recurrent* than *chronic*, and are associated with the tendency to attacks of acute coryza already referred to. These are best treated by change of air, and by tonics, of which as we have already said arsenic, or arsenic with iron, is the best. Injections of hazeline diluted with an equal quantity of water are also useful in these recurrent forms, and so also are injections of acetate of lead (4 to 16 grains to the ounce of distilled water).

Dry inhalations of pinol, eucalyptol, turpentine, menthol, and iodine may all be tried with advantage in different cases. If there is a tendency to the formation of crusts of inspissated mucus in the nostrils, these should first be washed away by injecting warm solutions of sodium bicarbonate and common salt (5 grains of each to the ounce), and the above astringent injections or inhalations should be applied subsequently.

The most troublesome and serious form of chronic nasal catarrh is that known as **ozæna** or atrophic rhinitis, characterised by the peculiarly offensive fœtid odour of the discharge from the nose, and of the expired air.

The anatomical condition corresponding to this somewhat obscure malady is a wasted or atrophic condition of the tissues within the nose. It is not known, with certainty, how the atrophy is brought about, or what is its precise relation to the fœtor which characterises the disease. The fœtor would appear, however, to be dependent to a great extent on the scanty secretion of mucus, and its tendency to dry up into crusts which decompose within the nasal cavity. It has been suggested that the particular kind of putrescence that occurs in ozæna may be due to the action of some specific ferment or microbe.

The **treatment** of these cases is mostly symptomatic and palliative, rarely radical and curative. The first indication is to remove *all* the crusts of inspissated and decomposing mucus retained within the nasal cavities. This is often a difficult matter. The second indication is to prevent their formation or re-accumulation; and the third is to improve the general health so as to modify the morbid tendency.

Professor Harrison, of Philadelphia,* considers the galvano-cautery the best means of removing the crusts and cleansing the cavities. The wire electrode, introduced cold, when heated, adheres firmly to the crusts, and removes them with ease. He also cauterises the *whole* of the nasal mucous membrane, doing only small portions at a time. "No disinfectant washes," he says, "are required if the discharge is removed as described," but this process is an exceedingly tedious one, requiring a month or six weeks for its completion,† and most other authorities make use of cleansing douches, and antiseptic applications.

The cleansing of the nasal cavities of the adherent crusts of mucus is usually effected by means of the nasal douche which, when properly applied, allows the stream of cleansing lotion to flow in at one nostril and out at the other, making thus a complete circuit of the nasal passages. The fluid usually employed for this purpose is a warm solution of chloride or bicarbonate of sodium (1 per cent.), and a large quantity must be passed through the nose until all the crusts are removed; steaming the nose, or syringing it, or applying a probe covered with cotton-wool may be used as auxiliary means for removing portions of dry mucus not detached by the douche. Sulphur-water with 2 per cent. of potassium chlorate; tar-water with 1 or 2 per cent. of sodium chloride; a weak solution of sodium salicylate, or of carbolic acid; these have all been used for irrigation of the nasal fossæ. Schnitzler uses for this purpose a lotion made with 3 drams of ammonium chloride, 4 drams of sodium bicarbonate, and ten drops of carbolic acid to a pint of distilled water.

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* Pepper's "System of Medicine," vol. iii. p. 48.

† Dr. Seiss disapproves of the application of the galvano-cautery as "far worse than useless," but approves of the application of the *faradic current*, the positive pole being applied to the nasal mucous membrane, and the negative pole held in the patient's hand. (Hare's "System of Practical Therapeutics," vol. ii. p. 432.)

This cleansing process should be applied twice or thrice daily. As soon as the nasal cavities are completely cleansed, antiseptic and deodorising substances are applied either in the form of paints or injections, or sprays, or bougies, or insufflations.

Schnitzler uses as a paint, to be applied with a brush, zinc chloride 16 grains, glycerine and water, of each ½ an ounce. Bamberger uses iodine 5 grains, potassium iodide 45 grains, dissolved in glycerine 10 drams. Lennox Browne uses iodoform 5 to 8 grains, sulphuric ether 45 to 70 minims, essence of rose five to eight drops, and vaseline 1 ounce. Lowenstein employs aristol, one part dissolved in ten parts of flexile collodion; or it may be used pure as an insufflation. He claims admirable results from its use. Rosenbach uses balsam of Peru; he paints the mucous membrane of the nose daily with it, and leaves in the nose, as deeply placed as possible, a plug of cotton wool soaked in it. Oil of turpentine has also been used.

As a spray Schnitzler uses a sublimate solution of 1 in 1,000, or the patient sniffs up a lotion consisting of 1½ dram of boric acid, 1½ dram of cherry-laurel water, and 8 ounces of water; or he prescribes an insufflation of equal parts of iodoform and roasted coffee in fine powder, or iodoform and benzoate of soda, of each 75 grains. Nasal bougies of iodoform each containing $\frac{1}{6}$ of a grain are used by Schrœtter.

Numerous other applications have been employed; some after anæsthetising the mucous membrane by the application of a 4 per cent. solution of cocaine, apply pure tincture of iodine; some an insufflation of ten parts of boric acid and three of camphor, three or four times a day.

In cases where any diseased bone can be discovered, this must of course be removed, and as these are likely to be syphilitic cases, appropriate general treatment must also be applied.

The general treatment must be determined by the individual character of each case. Some (scrofulous cases) will require cod-liver oil and the iodide of iron, others arsenic, others hypophosphite of lime, and all will need careful dieting and good air.

ACUTE LARYNGEAL CATARRH.

The remarks made with regard to the etiology of acute nasal catarrh, and with regard also to the prophylactic measures desirable to be taken by persons predisposed to that affection, apply with equal force to those who are prone to suffer from attacks of acute catarrh of the larynx.

The **treatment** appropriate to the acute attack itself in adults is also by no means dissimilar. In the early stage the advantage of small doses of opium, codeia, or morphine in allaying irritation and relieving the cough is most marked. It is well to combine them with small doses of ipecacuanha, or better still, of tartarised antimony. The administration of an eighth of a grain of acetate of morphia with one-twelfth of a grain of tartarised antimony every four or five hours; or 4 or 5 grains of the compound ipecacuanha powder every five or six hours, will usually relieve most of the distressing *symptoms*—the tickling cough, the soreness in the larynx itself, the difficulty in swallowing sometimes present, and the hoarseness or impairment of voice. Warm alkaline drinks are also of much value in thinning the tenacious adhesive mucus which often hangs about the glottis and upper part of the larynx, and is difficult of expulsion; for this purpose a third of a tumblerful of Ems, or Bourboule, or Apollinaris water, to which a tablespoonful or two of hot milk may be added, should be drunk every two or three hours; or the following mixture answers quite as well :—

℞ Sodii bicarbonatis	1 dram.
Sodii chloridi	20 grains.
Spir. chloroformi	30 minims.
Aquæ camphoræ	ad 6 oz.

M. ft. mist.

Of this mixture two tablespoonfuls should be taken every two or three hours with two tablespoonfuls of hot water or milk.

Some prefer ammonium chloride in 10-grain doses, instead of the sodium chloride in the above mixture, and 5 minims of vinum ipecacuanhæ, or 10 minims of vinum antimonialis, may be given with each dose if the cough remains hard and dry.

Counter-irritation and warmth in the shape of a small poultice of mustard and linseed applied over the larynx are of great service. Some, however, prefer ice-cold compresses, and these are most useful if applied at the very beginning of an attack.

The following liniment is also of great service, when rubbed into the throat over and adjacent to the larynx:

℞ Olei pini sylvestris	2 drams.
Linimenti camphoræ comp.	ad 1 oz.

M. f. linim.

If the bowels are confined and the tongue loaded, a saline aperient will be useful; 2 or 3 drams of Carlsbad salts, or the same quantity of sodium sulphate in half a glass of hot water will be the best.

It is of the greatest importance to avoid all causes of further irritation. The patient should therefore be kept to the house, and in one uniform temperature. All exercise of the voice should be forbidden, and the desire to cough should be resisted.

The inhalation of the vapour of hot water or of infusions of demulcent herbs (elder-flowers), or warm alkaline sprays containing some ammonium chloride

(5 to 10 grains to the ounce) are useful when the cough is hard and dry and there is difficulty in softening the tenacious and scanty mucous secretions.

Schnitzler considers the following solution applied with a hand-spray as the most efficacious of remedies :

℞ Cocainæ hydrochloratis	4 grains.
Potassii chloratis	75 ,, .
Aquæ laurocerasi	75 minims.
Ess. menthæ pip.	3 ,,
Aquæ	ad 8 oz.

M. f. mist.

In severe attacks it is generally an advantage to diffuse the steam of hot water through the atmosphere of the patient's room by means of what is known as a bronchitis-kettle, or by any other suitable means for keeping the air charged with hot vapour of water.

Direct local applications are rarely advisable in cases of acute catarrhal laryngitis, but they are of great service if the catarrhal condition persists and the case becomes chronic.

Acute laryngeal catarrh in adults is usually not a serious disease, but in a subacute form it often occurs with troublesome frequency in persons who have to use the voice much in singing or speaking, and it is then more difficult to treat, and tends to become chronic.

When, however, it supervenes in cases of infective disease, as erysipelas or small-pox, it is liable to lead to œdema of the glottis, and so directly imperil life.

But in **young children** acute laryngitis is often a grave malady on account of the attacks of nocturnal dyspnœa which frequently accompany it. These attacks often assume a very alarming aspect, and are constantly mistaken for attacks of true croup, especially by anxious parents.

A young child becomes affected with what is apparently a mild catarrhal affection, attended with a little sneezing and coughing, but without any dyspnœa or other alarming symptom ; but in the middle of the night it wakes up with an alarming attack of dyspnœa, accompanied with loud, stridulous inspiration, a dry, hacking cough, and hoarseness of voice. The dyspnœa is often intense and is attended with great restlessness and anxiety. Careful inspection of the throat will satisfy you that the attack is not due to any membranous or diphtheritic exudation. The dyspnœa is due to the fact that the larynx and glottis in young children are small and imperfectly developed, and the catarrhal swelling of the mucous membrane, together, probably, with the accumulation during sleep of dry, tenacious mucus on the margins of the glottis, is sufficient to cause considerable laryngeal stenosis and inspiratory obstruction. In some cases spasmodic contraction of the laryngeal muscles no doubt contributes to the dyspnœa. As a rule, these attacks of dyspnœa pass off after a longer or shorter interval, and are unattended by danger; but the attacks have such a serious and alarming appearance, and the anxiety of the little patient's relatives is generally so great, that some active treatment is urgently demanded to allay their fears and is usually rewarded with much apparent success.

Professor Widerhofer (Vienna) considers these attacks to be caused by drying of the *pharyngeal* mucous membrane during sleep, and that the proper treatment at first is to give the infant warm drinks—a tablespoonful of warm lemonade, or syrup and water or barley-water, every two or three minutes—to apply a warm wet compress to the throat, and to surround the child with the steam of hot water. In winter the air of the child's bedroom should be kept moist with the vapour of water, and the infant should be kept awake for an hour or two, so as to lessen the risk of developing the exciting cause.

If the child is a vigorous one, and there is turgescence of the vessels of the neck and face, no harm, and possibly some good, may be done by the application of a leech, or perhaps two, over the manubrium sterni. It is a proceeding which usually commends itself to the distressed parents, and it is a mistake to suppose that the abstraction of a small amount of blood in such cases can do any harm. The relief, indeed, so often afforded by this measure would seem to show that it does influence favourably the engorged or swollen or irritable laryngeal mucous membrane.

Hot sponges applied to the laryngeal region are useful; and while some think highly of a few small and rapidly repeated doses of aconite in these cases, others think better of emetic doses of ipecacuanha and tartarised antimony. Certainly a quarter to a sixth of a grain of tartarised antimony with 30 to 60 minims of ipecacuanha wine, mixed with two or three teaspoonfuls of warm water, will often cut such attacks short in a striking manner, probably by thinning the tenacious mucus adherent to the laryngeal mucous membrane and obstructing the glottis.

After vomiting has been produced, it is well to keep up a slightly nauseating effect by small doses of ipecacuanha or antimonial wine every hour or two in some saline mixture; and the child's bowels should be acted upon with a few grains of calomel or grey powder and a grain or two of jalapine.

If, however, there is œdema of the glottis, which cannot be thus relieved, and scarification is impossible or fails to be efficacious, while the dyspnœa continues to be alarming, then tracheotomy must be performed.

Attacks such as these are usually limited to childhood; but it does occasionally happen that **œdema of the glottis** suddenly sets in in the course of an acute laryngitis in the adult. In such cases, if the dyspnœa is alarming and the laryngeal stenosis cannot be overcome by scarification, no time should be lost, but recourse had speedily to tracheotomy. Happily these cases in adults are very rare.

Scarification of the swollen epiglottis is not always an easy operation, and in children you can rarely avail yourself of the aid of the laryngoscope. If the mouth can be kept open the index finger may be used as a guide to the epiglottis, and a guarded curved bistoury used to puncture the œdematous organ. An emetic may be useful after scarification to mechanically press out the œdematous fluid. Small pieces of ice may be sucked, and hot sponges kept applied to the neck. But tracheotomy should not be unnecessarily delayed in these cases.

In cases in which there is constant irritative cough without any dyspnœa, from 1 to 6 grains of Dover's powder, according to the age of the child, should be mixed with a few grains of sugar of milk, and divided into six powders, and one of these given every hour or two until the cough is relieved. To promote expectoration when this is difficult, as is the case with most children, the following mixture is useful:

℞ Ammonii chloridi	16 grains.
Sodii bicarb.	24 ,,
Syrupi senegæ	4 drams.
Aquæ	ad 4 oz.

A dessertspoonful (warm) every two hours.

CHRONIC LARYNGEAL CATARRH.

Repeated and neglected attacks of acute laryngeal catarrh lead to the establishment of a chronic catarrhal condition of the larynx, which is often tedious and difficult of cure. It is often brought on by overtaxing the vocal organs in public-speaking, singing, etc., so that it is common to find this affection amongst clergymen, public singers, and actors.

It is also, in some cases, due to an extension of a catarrhal condition from the pharyngeal mucous membrane, as in drunkards, and inveterate and immoderate consumers of tobacco. The hoarse voice of drunkards is well known. It also forms a part of the morbid changes which affect the larynx in phthisis and syphilis. We shall here only consider briefly the treatment of the simple form of chronic laryngeal catarrh characterised by three prominent symptoms—hoarseness, cough, and expectoration.

The treatment of this troublesome affection requires, first of all, the removal of the exciting cause.

Absolute rest of the organ must be insisted upon in the case of public speakers, actors, and singers, and the advantage they often derive from a few weeks' residence and treatment at such spas as Eaux Bonnes or Mont Dore probably depends as much on the enforced repose and the healthiness of the out-of-door life they lead there in pure, tonic air, as on the use of the mineral waters of those springs.

Local applications are mainly to be relied upon in the treatment of this disease. These are applied to the larynx by the physician himself, usually by means of a brush and with the help of the laryngoscope.

Various astringent remedies are employed for this purpose, and each physician usually has his favourite remedy. Ziemssen extols the use of strong solutions of nitrate of silver, 16 grains and upwards to the ounce, and they are, doubtless, amongst the most efficacious remedies: the good effect lasts much longer than that of milder astringents, so that an application once a week or once a fortnight will suffice. Solis Cohen also thinks highly of painting the vocal cords, in obstinate cases of chronic laryngitis in those who have to use the voice much, with solution of nitrate of silver. He applies a solution of 10 grains to the ounce daily for a few days, then at longer intervals, and finally he applies, once a week, a solution containing 40 to 60 grains to the ounce. Others prefer the chloride of zinc (20 grains to the ounce), others chloride of iron (20 grains to the ounce), alum (10 grains to the ounce), tannin (10 grains to the ounce), and so on.

Inhalations of the vapour of oil of turpentine (five to twenty drops), or of pinol, with camphor, evaporated from the surface of hot water, are often useful. The inhalations should be used twice or three times a day for from ten to twenty minutes at a time.

Insufflations of various powders are in common use in these cases: tannin, or alum, or boric acid, or bismuth subnitrate mixed with equal parts of sugar of milk may be used, with or without the addition of a small amount of morphine hydrochlorate.

In the intervals of, or as alternatives to these applications, the use of astringent or alkaline *sprays* may be beneficial. These may be applied with an ordinary hand-spray, but Siegle's steam-spray producer, perhaps, is the best apparatus for their production and application. As an astringent, a solution of tannin or alum, 5 grains to the ounce, is perhaps the best. The spray should be applied twice a day for about five minutes each time.

In cases where the mucus secretion is scanty and tenacious and difficult of removal from the mucous membrane and vocal cords, warm alkaline sprays are of much value. A solution of sodium bicarbonate and common salt, about 5 grains of each to the ounce, is one of the best. It is often advisable to cleanse the mucous membrane first with a warm alkaline spray before using the astringent application. Three or four ounces of Ems or Bourboule water, drunk with a little hot milk, night and morning, will also be found useful in promoting the solution and expulsion of dry, inspissated mucus. We have seen very great and permanent as well as immediate benefit result from the diligent use of warm Bourboule water, applied locally to the larynx by means of a hand-spray, in subacute, irritable cases.

From the number of priests, singers, and actors with laryngeal catarrh found frequenting the springs of Mont Dore and La Bourboule, and also the sulphur springs of Eaux Bonnes and Cauterets in the Pyrenees, we may conclude that they derive benefit from these waters, as well as from the course of life prescribed for them at those places.

Schnitzler recommends that *massage* should be applied to the front and sides of the neck for two or three minutes at a time, the fingers of the operator being well covered with pomade.

One of the most efficacious remedies in the treatment of chronic or recurrent laryngeal catarrh is change of climate. In some instances a change from a low-lying or damp inland district to the sea-side, or to a more elevated and drier locality, is sufficient to bring about a cure, or very great amelioration. But in more obstinate cases, and when it is practicable, removal to a more equable and milder winter climate than can be met with in Great Britain is desirable; the winter climate of Madeira, the Canaries, and some of the islands of the West Indies, or a sea voyage in southern seas, is perhaps best suited to the majority of cases. Some cases, however, do well in the drier climate of Egypt, especially persons who find themselves better in a dry and bracing atmosphere. High elevations are not suited, as a rule, to these cases, save in exceptional instances and in exceptionally fine seasons; the rapid changes of temperature, and the occasional occurrence of severe weather, with cold mists and heavy snow-falls, are apt to aggravate the catarrhal state of a sensitive larynx. Moderate elevations, however, such as that of Mont Dore, or Cauterets, or Meran often produce great benefit in these cases.

ADDITIONAL FORMULÆ.

Mixture for acute laryngitis.

℞ Liquor. morphinæ hydrochlor., 2 drams.
Vini antimonialis, 2 drams.
Succus conii, 6 drams.
Liquor. ammonii acetatis, 2 oz.
Aquæ camphoræ ad 10 oz.

M. f. mist. A tablespoonful every four hours. (*Whitla.*)

Mixture for acute suffocative laryngitis in children.

After an emetic.

℞ Kermes mineralis, $\frac{3}{4}$ to $1\frac{1}{2}$ gr.
Tincturæ aconiti, 5 to 10 min.
Tincturæ belladonnæ, 5 to 10 minims.
Syrupi flor. aurantii, 1 oz.
Aquæ anisi ad 5 oz.

M. f. mist. A dessertspoonful every hour or half-hour. (*Simon.*)

For acute laryngitis in children.

℞ Apomorphinæ hydrochloratis, $\frac{1}{3}$ grain.
Acid. hydrochlorici diluti, 3 drops.
Syrupi senegæ, 5 drams.
Aquæ ad $1\frac{1}{2}$ oz.

M. f. mist. A teaspoonful every hour. (*Monti.*)

For the subacute laryngitis of vocalists.

1. An aperient.
2. A laryngeal spray of 1 per cent. solution of cocaine.
3. The following lozenges—

℞ Morphinæ bimeconatis, $\frac{1}{100}$ grain.
Cocainæ hydrochloratis, $\frac{1}{125}$ grain.
Tinct. aconiti, $\frac{1}{6}$ minim.
Rad. althææ pulv., $\frac{1}{2}$ grain,

in each, one to be taken frequently.

4. As a preparation for a vocal effort after acute symptoms have subsided, $\frac{1}{60}$ grain of strychnine after breakfast and lunch, and $\frac{1}{30}$ grain after dinner. (*Faulkner.*)

As an expectorant in catarrhal laryngitis in children.

℞ Potassii iodidi, 15 to 30 grains.
Syrupi senegæ, 3 drams.
Aquæ ad 3 oz.

M. f. mist. A dessertspoonful every two hours. (*Monti.*)

Sedative spray or gargle in laryngitis.

℞ Cocainæ hydrochloratis, 8 grains.
Glycerini acidi carbolici, 2 drams.
Aquæ rosæ ad 8 oz.

M. To be used occasionally as a gargle, and frequently as a spray. (*Whitla.*)

Inhalation or spray.

℞ Sodii benzoatis, $1\frac{1}{2}$ dram.
Glycerini, 5 drams.
Aquæ destill. ad 8 oz.

M. (*Monti.*)

Inhalation in acute catarrhal laryngitis to relieve heat and tickling in the throat.

℞ Aquæ laurocerasi, $1\frac{1}{2}$ dram.
Spir. vini rectif. ad 3 oz.

M. A dessert- or table-spoonful to be inhaled night and morning. (*Schrœtter.*)

Inhalation or spray in chronic catarrhal laryngitis.

℞ Acidi tannici, 15 grains.
Spr. vini rectif., $2\frac{1}{2}$ drams.
Aquæ ad 2 oz.

M. (*Schrœtter.*)

Inhalation for chronic laryngitis.

℞ Ol. pini sylvestris, 2 to 3 drams.
Magnesii carb. levis, 60 to 90 grains.
Aquæ ad 3 oz.

A teaspoonful to be added to a pint of water at 150° F. and inhaled for five minutes two or three times a day. (*Mackenzie.*)

Gargle for hoarseness from fatigue of voice.

℞ Acidi tannici, 1 dram.
Glycerini boracis, 2 drams.
Tinct. capsici, $1\frac{1}{2}$ dram.
Infusi rosæ acidi ad 10 oz.

M. f. gargar. To be used frequently. (*Whitla.*)

Treatment of chronic catarrhal laryngitis.

1. Drink infusion of pine cones (1½ dram to a pint of water).

2. A glass of sulphur water in the morning (Eaux Bonnes, Cauterets, or Enghien).

3. Inhale tar vapour.

4. Apply to the larynx the following solution :—

℞ Zinci chloridi, 15 grains.
Aquæ destill., 1 oz.
M. f. solut.

Powder for insufflation in scrofulous rhinitis.

℞ Zinci sulphocarbolatis, 5 grs.
Bismuthi salicylatis, 60 grs.
Iodol, 45 grains.
Zinci tannatis, 15 grains.
Talc, 150 grains.

M. f. pulv. To be used as a snuff. (*Nouveaux Remèdes.*)

Powder for catarrhal rhinitis.

No. 1.

℞ Alumenis pulv., 30 grains.
Boracis, 30 grains.
Menthol, ⅓ grain.
Zinci tannatis, 45 grains.
Bismuthi tannatis, 45 grns.
Lycopodii, 2 drams.
M. f. pulv.

No. 2.

℞ Zinci salicylatis, 1 dram.
Bismuthi tannatis, 1 dram.
Boracis pulv., ½ dram.
Salol, 20 grains.
Talc, 2 drams.
M. f. pulv.

(*Nouveaux Remèdes.*)

CHAPTER II.

THE TREATMENT OF CATARRHAL AFFECTIONS OF THE RESPIRATORY ORGANS: ACUTE BRONCHIAL CATARRH.

ACUTE BRONCHIAL CATARRH.—*Prophylactic measures*—Treatment of different Forms —*Mild* Forms — Diaphoretics — Alkaline Waters—Tartarised Antimony—Opium—Aconite—Poultices—Aperients—Alkaline Expectorants—*Graver* Forms—Indications for Treatment—Leeches—Dry-cupping—Blood-letting—Counter-irritation—Tartarised Antimony and Opium—Stimulating Diaphoretic Drinks—Dangers of Opium—Inhalations—Cold Air—Aqueous Vapour—Alkaline Sprays—Conium and Belladonna Sprays—Compressed Air—Carbolic Acid Spray—Ipecacuanha and other Expectorants — Squills — Senega—Ammonia—Chloroform as an Expectorant—Stimulants and Tonics—Potassium Iodide and Ammonium Chloride—Emetics—Oxygen Inhalation in Capillary Bronchitis of Children—Quinine and Arsenic in Febrile Cases — Alcohol — Ether — Digitalis — Strychnine — Lobelia — Chloroform Inhalation — *Diet.* Additional Formulæ.

IN considering the management of cases of bronchial catarrh, we shall first call attention to **prophylactic** measures.

Young children with a tendency to such attacks should be carefully guarded against exposure to chill, or to rapid and great changes of temperature, and every opportunity should be taken to brace and harden them so as to diminish the morbid sensitiveness of surface upon which the liability to catarrhal attacks depends. In the warm season cold affusion, cold douching or sponging should be cautiously practised, together with vigorous friction of the surface.

Abundant exercise in the open air, the child being warmly and suitably clad, with flannel next the skin, is of use also. But exposure on raw, cold, windy days must be especially guarded against, particularly with very young children.

The general nutrition of young children with this predisposition must also be looked to, especially if there is any tendency to scrofula or rickets. In such cases the tonic influence of the phosphates of lime and iron and of cod-liver oil is particularly noticeable.

With old people great caution is necessary in protecting them from exposure to changes of temperature, to draughts, to cold, damp air, and they should not reside in cold, damp localities. They should pass the winter, when possible, in a warm, equable, sunny climate, or, if this is not possible, be content during the bad weather of the British winter and spring to remain in a set of apartments kept at a uniform temperature.

The **treatment** of **acute bronchial catarrh** will, necessarily, depend on the particular form of the malady with which we may have to deal. It may, and often does, occur as a comparatively slight malady, unattended with any risk or danger if ordinary care and caution in its management be adopted. On the other hand, it also often occurs as one of the most serious and dangerous maladies we encounter, frequently fatal, and taxing all our skill in its treatment. Much of its seriousness depends on the age and vigour of the patient attacked, on the extent of the bronchial surface involved, and on the complications that may attend it. An attack of acute bronchial catarrh may be limited entirely to the trachea and larger divisions of the bronchi, and show no disposition to spread beyond them. These are the slight cases, but an attack of acute bronchial catarrh may also be diffused over a wide extent of the bronchial surface, and extend even to the finest ramifications of the bronchial tubes. These cases of *capillary* bronchitis are of the gravest import. Such attacks prove very fatal to children and to feeble and aged persons, and are of great gravity even when affecting robust adults.

In the first place we shall consider the treatment appropriate to a **mild** case of acute bronchial catarrh in a previously healthy adult, and limited to the larger bronchi. Such an attack will usually be attended with a slight degree of fever ; there will be more or less cough, usually at first dry and painful, attended with a feeling of soreness or rawness referred to the upper sternal region. Dry, sonorous, rhonchal and sibilant *râles* will be heard over both sides of the chest, loudest over the upper part. Usually there is but little dyspnœa, unless the attack be complicated with some spasmodic asthma.

The patient should be kept in bed in a room the temperature of which should at no part be lower than 65° F. nor higher than 70° F. The air of the room should be kept moist and unirritating by causing the steam of hot water, by means of a bronchitis-kettle, to be freely diffused through the apartment. The treatment may often be advantageously commenced by putting the patient in a hot bath in which a bag of bran has been well wrung out. Warm mucilaginous or slightly alkaline drinks should be given freely, and varied according to the taste of the patient—barley-water, linseed tea, thin gruel; but many patients prefer a mixture of hot milk and seltzer, or apollinaris, or soda water. These alkaline drinks have a beneficial influence on the secretion from the inflamed mucous membrane, and tend to diminish its tenacity, and so promote expectoration, and in this way they relieve the cough.

The addition of 2 to 4 teaspoonfuls of cognac, whisky, or rum to 3 to 6 ounces of hot milk and seltzer water makes an excellent soothing expectorant drink.

But there is no remedy which relieves the distressing dryness of the mucous membrane in the early stage of acute bronchial catarrh so completely as **tartarised antimony.** Quite small doses of this drug, combined with small doses of morphia, codeia, or opium will be found most efficacious in relieving these slight attacks of acute bronchial catarrh. The opium relieves the irritative cough by lessening the sensitiveness of the bronchial mucous membrane, and the antimony greatly increases the secretion from it, and so relieves the dryness and swelling which accompany the first stage of bronchial catarrh. Or a draught containing 5 to 10 grains of Dover's powder, 1 dram of spiritus ætheris nitrosi, 3 drams of liquor ammonii acetatis, and 1½ ounce of camphor water, at bed-time, and a saline aperient the morning following, is an excellent remedy in mild forms.

When there is much fever, and the temperature at the outset reaches nearly 103°, a few doses of aconite will be found useful, at the commencement of the treatment, especially in young people.

The following are useful formulæ.

When there is not much fever, and the chief object is to relieve the cough, and the dryness and soreness of the mucous membrane by promoting expectoration, this mixture should be given to adults:

℞ Vini antimonialis	1½ dram.
Liq. morphinæ acetatis	1 ,,
Liq. ammonii acet.	1 oz.
Aquæ laurocerasi	2 drams.
Syrupi mori	3 ,,
Aquæ	ad 6 oz.

M. f. mist. Two tablespoonfuls every two or three hours.

It should be given less frequently as the symptoms are relieved. In the case of persons who do not bear morphine well *codeia* may be used in its place in the dose of ⅙ or ¼ of a grain.

If there is much fever, then the following may be prescribed:

℞ Tinct. aconiti	24 minims.
Vini antimonialis	2 drams.
Liq. morphinæ acet.	80 minims.
Liq. ammonii acet.	1 oz.
Aquæ camphoræ	ad 8 oz.

M. f. mist. Two tablespoonfuls every two or three hours.

If for young children, the morphine should be omitted, and ½ an ounce of syrup of tolu added. The dose would be one or two teaspoonfuls according to the child's age.

Much relief is also given by a large hot poultice of linseed and mustard, applied over the top of the chest in front and also behind, between the scapulæ.

An aperient is often necessary and useful. One or two grains of extract of aloes with 1 grain of powdered ipecacuanha in a pill at bed-time, and the following morning two teaspoonfuls of Carlsbad salts in half a tumblerful of hot water, will be found a pleasant and effectual purge, and if the tongue is thickly coated, and the urine high-coloured, ½ a grain of calomel may be added to the pill.

With this treatment in those milder forms, the acute stage will rarely last more than a day or two, and the white, scanty, frothy, sticky expectoration of the first stage will be replaced by a more abundant, muco-purulent secretion. This change in the character of the secretion is an indication that the attack is passing off. It is now desirable to discontinue the antimony and the morphine, or to give it only at night for the relief of cough. It should be borne in mind that remedies like opium, antimony, and aconite are only given to relieve definite symptoms, and when those are relieved these drugs should be at once discontinued.

An alkaline, mildly stimulating expectorant is now useful, such as the following:

℞ Sodii bicarb.	60 grains.
Sodii chloridi	24 ,,
Ammonii carb.	24 ,,
Syrupi tolutani	3 drams.
Infusi senegæ	ad 6 oz.

M. f. mist. Two tablespoonfuls every six hours; a pill of a grain and a half of quinine, and a quarter or half a grain of powdered ipecacuanha, may at the same time be given twice or three times a day, and will promote convalescence.

A tablespoonful of brandy or whisky in a teacupful of hot milk and water, three or four times a day, is an excellent expectorant.

With this method of treatment patients may usually be carried safely through these commoner and slighter forms of acute bronchial catarrh, and convalescence will be rapid and complete.

Next as to the treatment most appropriate to the **graver** forms of acute bronchitis: to those cases in which the catarrhal inflammation is diffused over a great extent of the bronchial mucous membrane, and affects not only the larger tubes, but those also of medium size, and sometimes even the smallest ramifications.

Such cases when they occur, even in vigorous adults, are very grave and require most careful management; but when they occur, as they often do, in young and delicate children or in old and feeble persons, they are attended with the greatest danger.

When the finer bronchial tubes become attacked, and their calibre diminished by the inflammatory swelling of their lining membrane, and when many of them become blocked up by the accumulation in them of viscid secretion, it can readily be understood how imminent must be the danger of death by apnœa.

The objects we should keep in view in the treatment of such cases are these: *a.* To diminish the inflammatory hyperæmia and swelling of the bronchial mucous membrane. *b.* To thin and liquefy the catarrhal secretion when it is dry and scanty. *c.* To lessen it when excessive. *d.* To promote its expulsion from the air-passages and so obviate their obstruction. *e.* To allay excessive sensibility of the bronchial mucous membrane. *f.* To maintain and promote the circulation in the lungs, and prevent pulmonary engorgement and distension of the right side of the heart. *g.* To reduce fever and maintain the general strength.

The several details of treatment by which these indications may be carried out will have to be modified and adapted to individual cases.

Much will necessarily depend on the age and vigour of the patient, as well as on the stage which the disease has reached when it first comes under treatment. Remedies most appropriate in the earliest stage, and in a young and vigorous adult, might be altogether unsuited to more advanced stages, to a young child, or to an old and feeble person.

We will first consider the treatment of a severe attack of acute bronchitis in a young and robust adult seen at its onset. The air of the apartment must be kept warm and moist, as already pointed out.

If there is much oppression of breathing referred to the upper part of the sternum, half-a-dozen leeches applied over the *manubrium sterni* will be a judicious measure, and with this may be associated dry cupping over the back of the chest and in the interscapular region. This measure will afford much relief in robust persons when the dyspnœa and sense of oppression are severe.

General bleeding is rarely necessary; it may, however, be had recourse to in certain very acute cases, when the dyspnœa is extreme, the surface livid, and the danger of death from apnœa imminent. The removal of a few (6 or 8 ounces) of blood will relieve the engorgement of the right side of the heart, and, at the same time, the pulmonary venous congestion. "The disease is not arrested by this treatment, but a special danger is averted, and time is gained for the employment of other measures" (*Wilson Fox*). But venesection is never desirable in children, or in old or debilitated persons.

In most cases it will be advisable to apply large linseed and mustard poultices over the front and back of the chest; and when the skin is too tender to allow of further counter-irritation, a hot jacket-poultice of linseed meal must be used instead.

The hot jacket-poultice probably acts by dilating the vessels of the surface, and so reducing blood-pressure in the veins and the right side of the heart, while by its heat it acts as a cardiac stimulant.

We do not think any form of counter-irritation acts better than the linseed and mustard poultice when well made and carefully applied. But they are sometimes made badly, and applied carelessly, so that it is not very unusual to find a poultice around the patient's loins instead of his chest!

We would call *special* attention to the importance of applying these moist poultices carefully, *neatly*, and accurately. We occasionally see patients in a state of great discomfort from the untidy application of moist cloths and poultiçes to the chest, which soon lose their warmth and become a source of danger as well as discomfort. It is better to apply hot, *dry* flannels sprinkled with turpentine than unskilfully made poultices. Indeed, we think the application of the moist poultice is often overdone, and continued too long. After a time it is better to replace them with a simple layer or two of warm cotton-wool sprinkled with a little turpentine or pine oil, especially when the patient complains of discomfort from the moist application.

Of internal remedies we are quite of Stokes's opinion that "there is no remedy that possesses such a decided power over acute bronchitis" as **tartarised antimony**; but its success depends much on its early administration, *i.e.* when the bronchial mucous membrane is dry and tumid, and before secretion has become abundant, and when the skin is hot and dry and the pulse hard and frequent. It should be given in small repeated doses, combined with other diaphoretics, and in some cases with opium or codeia. Appropriate formulæ have already been given.

Doses sufficiently large to cause general depression are not needed. We believe the small doses already named, viz. 15 to 20 minims of the antimonial wine for adults, and 5 to 10 minims for children, quite sufficient for the purpose in view. Tartarised antimony in these small doses often produces less nausea than ordinary doses of ipecacuanha.

Warm alcoholic drinks are needed to keep up the force of the circulation, while, at the same time, they favour diaphoresis, reduce fever, and promote expectoration. Two or three ounces of hot milk or whey, with an equal quantity of seltzer or soda water and a tablespoonful of brandy or whisky, should be given every three or four hours.

The advantage of procuring profuse *diaphoresis* in acute bronchitis has been fully dwelt upon by Niemeyer; whether it acts by derivation from the bronchial mucous membrane, or in some other way, it is certain that profuse sweating is constantly attended with marked relief to the catarrhal symptoms.

Free evacuation of the bowels should be regularly obtained, so as to favour the descent of the diaphragm and afford as complete expansion of the lungs in breathing as possible; while by unloading the portal system of veins, any tendency to distension of the right side of the heart is to that extent relieved. For adults it is as well to give at bed-time occasionally $\frac{1}{2}$ a grain of calomel in a pill with a grain or two of the watery extract of aloes, and a teaspoonful of Carlsbad salts the following morning. In the case of children $\frac{1}{4}$ of a grain of calomel may be given with 2 to 5 grains of compound scammony powder.

It is necessary to insist strongly on the importance of using the *greatest discretion* in the administration of opium in these cases of severe diffused acute bronchial catarrh. The more diffused the catarrh, the more cautious must we be in the administration of opium. In old people and in young children opium is scarcely at all admissible, and even in adults, where there is much obstruction to the entrance of air into the lungs from the abundance of secretion in the air-passages, opium is a very dangerous drug.

The effect of opium is to check cough and diminish secretion; the former it does partly by lessening the sensitiveness of the bronchial membrane, and the latter by modifying the capillary circulation in it. But in cases of "suffocative" bronchitis, while we might desire to diminish the secretion, we dare not deaden the sensitiveness of the bronchial mucous membrane, or do anything to check the cough. So long as the air-passages are obstructed by catarrhal exudation we depend upon the cough to clear and set free the obstructed air-passages, and we only desire to make it more efficient to that end.

It is extremely important to bear this in mind in connection with the use of opium in bronchial catarrh ; a dose of opium given injudiciously may produce a fatal somnolency, and, by quieting the cough, lead to fatal blocking up of the air-passages.

If you give opium at all in such cases, give it only in very small doses, and only when the patient is watched by some thoroughly trustworthy person ; but never give it at night to procure sleep, however trying the cough may be, or however urgent the patient or the attendants may be for a sedative.

Remember that opium is rarely ever admissible in the diffuse bronchial catarrhs of old persons and young children. When it is very necessary to secure a few hours' sleep, it is better to give from 5 to 20 grains of chloral, with an equal quantity of bromide of sodium ; and then the patient must not be allowed to sleep more than two or three hours at a time, unless the respirations are free and regular, for the secretions tend to accumulate in the bronchi during sleep, and hinder the access of air to the air-cells. It is often necessary to give the patient on waking from sleep some diffusible stimulant to aid him to expel the mucus which has accumulated in the air-passages. A little brandy with hot milk and seltzer water is excellent for this purpose.

With regard to the use of **inhalations,** Oertel recommends, when the expectoration is scanty and difficult, and the mucous membrane dry, inhalations of Ems water, or weak solutions of sal ammoniac or bicarbonate of soda.

An agreeable and useful atmosphere for the patient to inhale is produced by dropping twenty or thirty drops of *pinol* on to the water in a bronchitis-kettle; the vapour of the pinol is thus diffused through the room together with the hot aqueous vapour given off by the water in the kettle.

In the acute bronchial catarrh of children, especially those accompanying infective diseases, such as measles and pertussis, we have found the frequent inhalation of a warm spray containing bicarbonate of soda and glycerine of carbolic acid of the greatest service in promoting expectoration.

We use the following proportions:—

℞ Sodii bicarbonatis	10 grains.
Glycerini acidi carbolici	1 dram.
Aquæ destill.	1 oz.

By means of a Siegle's steam-spray producer the spray should be allowed to play freely before the child's mouth and nose so that he *must* inhale it with the inspired air.

As soon as the first stage is over, and the scanty and tenacious glairy secretion has been replaced by an abundant muco-purulent one, we must discontinue the use of tartarised antimony, or replace it by small doses of ipecacuanha; and now is the appropriate period for the administration of the stimulating expectorants, such as *squills* and *senega*, in combination with carbonate of ammonia.

Spirit of chloroform is also an excellent expectorant, while it also soothes and allays the cough.

A suitable formula is the following:

℞ Ammonii carbonatis	32 grains.
Tincturæ scillæ	80 minims.
Spir. chloroformi	120 ,,
Infusi senegæ	ad 8 oz.

M. f. mist. Two tablespoonfuls every four or five hours.

If the cough remains troublesome, it may be advantageous to add to each dose of the above mixture 5 minims of wine of ipecacuanha and 30 minims of compound tincture of camphor.

On the other hand, as convalescence advances the tincture of squills in the above mixture should be replaced by 1-dram doses of tincture of cinchona.

In all such cases symptoms of debility and loss of power must be immediately encountered by the administration of alcoholic stimulants.

In *debilitated* persons, and when we do not encounter the case in its earliest stage, a combination of carbonate of ammonia, ipecacuanha (in small doses), and bark, as in the subjoined formula, with warm stimulating drinks, and the inhalation of warm alkaline sprays to thin the secretions—these are the measures to be relied upon.

℞ Ammonii carbonat.	40 grains.
Vini ipecacuanhæ	40 minims.
Tinct. cinchonæ	1 oz.
Aquæ chloroformi	ad 8 „

M. f. mist. Two tablespoonfuls every four hours.

In somewhat advanced cases, especially in the rheumatic or gouty, when the expectoration is tenacious, scanty, and difficult of expulsion, potassium iodide is a most valuable remedy; it may be combined with ammonium chloride, as in the following formula:

℞ Potassii iodidi	40 grains.
Ammonii chloridi	80 „
Ammonii carbonatis	āā 40 „
Sodii bicarb.	
Tinct. senegæ	4 drams.
Aquæ chloroformi	ad 8 oz.

Two tablespoonfuls, with two of hot water, three or four times a day.

In the case of young children who cannot expectorate, we must give occasional **emetics.** Ipecacuanha is the best. Twenty grains of powder of ipecacuanha mixed with a tablespoonful of syrup and water will usually have the desired result. The effect of the emetic is not only to promote expectoration, but by the mechanical compression of the lung it induces it tends also to relieve congestion. The sticky mucus which accumulates in the child's mouth after vomiting should be carefully removed.

Some prefer the hydrochlorate of apomorphia as an emetic in these cases. One-twentieth of a grain injected hypodermically can usually be relied upon to produce vomiting in ten minutes. When a child cannot be induced to swallow an emetic, this is obviously a valuable alternative; the objection to its use is that it sometimes produces great depression.

Emetics are also useful in cases other than those of children, when, owing to debility of the bronchial muscles, the catarrhal secretions are retained in the air-passages. This state "may be detected when, immediately after the act of coughing, the *râles*, instead of subsiding for a time, persist with scarcely any diminution. In such an emergency, should the expectorants fail, an emetic is imperatively indicated" (*Niemeyer*). Ipecacuanha or zinc sulphate should be used.

In order to ward off the danger of pulmonary collapse in young children, the child may be roused to more active respiratory efforts by putting him into a hot bath, and sprinkling cold water on the chest while in it. Nor should he be allowed to fall into a prolonged or deep sleep, but should be aroused from time to time, and some stimulant given.

The *inhalation* of *oxygen* has been found of remarkable value in some cases of capillary bronchitis in infants after all other means have failed. It has rapidly relieved the dyspnœa and the cyanosis, and led to ultimate recovery.

In cases in which there is a tendency to the maintenance or recurrence of fever, quinine must be given, or, if this is not well tolerated, arsenic. The latter drug may be given in combination with nux vomica, ammonia, and cinchona as follows:

℞ Liq. arsenicalis	24 minims.
Tinct. cinchonæ comp.	1 oz.
Tinct. nucis vomicæ	2 drams.
Ammonii carb.	32 grains.
Aquæ chloroformi	ad 8 oz.

M. f. mist. Two tablespoonfuls three times a day.

Quinine may be given in combination with expectorants, as in the following prescription:

℞ Tinct. quininæ ammoniatæ	2 oz.
Tinct. nucis vomicæ	2 drams.
Spirit. chloroformi	2 ,,
Tinct. senegæ	ad 3 oz.

M. f. mist. Two teaspoonfuls in a wineglass of water three times a day.

In aged patients, and especially when acute bronchitis is accompanied by old emphysema of the lungs, together with dilatation of the right side of the heart, there is often great difficulty in promoting expectoration and in maintaining cardiac action. In such cases we must give stimulants freely—a tablespoonful of brandy or whisky, with a little hot milk and seltzer or apollinaris water, every hour; or in some cases champagne may be given if the patient prefer it.

A mixture of ether, ammonia, and digitalis may be of use to stimulate the failing cardiac power:

℞ Tinct. digitalis	80 minims.
Spir. ætheris	4 drams.
Ammonii carb.	40 grains.
Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls every two or three hours while necessary.

Or the action of the heart may be maintained by hypodermic injections of strychnine, and the dyspnœa relieved by oxygen inhalations. Strychnine acts powerfully on the respiratory centre, and its administration is an invaluable expedient in the later exhaustive stages of acute bronchitis.

Spasmodic dyspnœa, with dry *râles*, may require the administration of the etherial tincture of lobelia. This may be given combined with ammonia, and small doses of morphine, remembering the caution we have already given about the use of the latter drug:

℞ Tinct. lobeliæ ætheriæ	2 drams.
Ammonii carbonatis	30 grains.
Liquoris morphinæ hydrochlorati ...	60 minims.
Aquæ	ad 6 oz.

M. f. mist. One or two tablespoonfuls every two or three hours until relieved.

The inhalation of chloroform may sometimes be necessary to relieve spasmodic dyspnœa. If the dyspnœa is caused or aggravated by intestinal flatulence, and if this has arisen from an unwise disinclination to keep the bowels well relieved by aperients, the desirability of which we have repeatedly insisted upon, then we may administer a turpentine or rue enema, and give a warm aperient pill, and draught: 5 grains of the compound rhubarb pill with 5 grains of the aloes and asafœtida pill, followed by a draught containing 2 drams of sulphate of soda, 3 drams of tincture of senna, and 1½ ounce of caraway water.

The **diet** during an attack of acute bronchitis of any severity should be *fluid* in the main. Milk when it is well borne and easily digested is excellent—it should usually be given warm. Nourishing soups, gruels, and broths which favour diaphoresis should also be given. Beaten-up eggs, the yolks of lightly boiled or poached eggs, and custard pudding, are all useful. Light puddings, tapioca, ground-rice, or arrowroot, are permissible, and if the tongue is fairly clean a little pounded meat or chicken may be added to the animal broths. An occasional cup of light tea is refreshing and stimulating. In the slighter cases fish and chicken may be allowed. In convalescence we should prescribe a nourishing diet carefully adapted to the digestive capacities of individual patients.

Dujardin-Beaumetz insists on the importance, in severe cases, of arranging the patient's position in bed so as to counteract the tendency to passive or hypostatic congestions; he should, therefore, be almost raised to the sitting position, and he should not be allowed to rest long on one side.

ADDITIONAL FORMULÆ.

Emetic powders in acute bronchitis (for adults).

℞ Antim. tartar., 2¼ grains.
Pulv. ipecac., 75 grains.
M. et divide in pulv. 3.

(*Bamberger.*)

Powders for acute bronchitis with abundant stringy expectoration difficult to expel.

℞ Acidi benzoici, 12 grains.
Pulv. gum acaciæ, 75 grains.
M. et divide in pulv. 6. A powder every two hours.

(*Bamberger.*)

Powders to relieve the cough of acute bronchitis.

℞ Morphinæ hydrochlor., 1½ gr.
Pulv. ipecac., 3 grains.
Sodii bicarbonat., 75 grains.
Sacchari albi, 75 grains.

M. et divide in pulv. 12. One every six hours. (*Bamberger.*)

Mixture for acute bronchitis in children.

℞ Vini antim., 1 dram.
Vini ipecac., 2 drams.
Liq. ammon. acet., 4 drams.
Syrupi tolut., 4 drams.
Aquæ ad 2 oz.

M. f. mist. A teaspoonful every two hours for a child two years old. (*Whitla.*)

Another to follow preceding.

℞ Potassii iodidi, 1 dram.
Vini ipecac., 3 drams.
Spr. chloroformi, 3 drams.
Infusi senegæ ad 4 oz.

M. f. mist. A teaspoonful after meals. (*Whitla.*)

Mixture in acute bronchitis.

℞ Ammonii chloridi, 30 grains.
Tinct. opii, 12 to 24 minims.
Syrupi senegæ, 6 drams.
Dec. althææ (1 in 10 or 20) ad 8 oz.

M. f. mist. Two tablespoonfuls every two hours. (*Bamberger.*)

Mixture for acute capillary bronchitis.

℞ Vin. antimonialis, 4 drams.
Spr. chloroformi, 4 drams.
Spr. ammon. arom., 1 oz.
Liq. ammoniæ acet., 2 oz.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful every two hours. (*Whitla.*)

Another for acute bronchitis with cardiac valvular disease.

℞ Tinct. digitalis, 2 drams.
Spirit. ætheris, 4 drams.
Spirit. chloroformi, 2 oz.
Spirit. ammon. arom., 1 oz.

M. f. mist. A teaspoonful in a small wineglass of water every three hours. (*Whitla.*)

Mixture for acute bronchitis.

℞ Tinct. veratri viridis, 1½ dr.
Vini antimonii, 4 drams.
Tinct. opii camphoratæ, 2½ oz.
Liq. ammon. acetatis, 2 oz.

M. f. mist. A teaspoonful in a tablespoonful of water every two, three, or four hours (smaller doses for children).
(*Prof. Davis, M.D., Chicago.*)

For capillary bronchitis with lobular pneumonia.

℞ Antimonii tartarati, 2 grains.
Morphinæ sulphatis, 3 grs.
Ammonii chloridi, 3 drams.
Extr. glycyrrhizæ fluid., 1 oz.
Syrupi, 3 oz.

M. f. mist. A teaspoonful with a tablespoonful of water every three or four hours.
(*Prof. Davis.*)

Spray for inhalation to relieve cough from excessive hyperæsthesia of bronchial mucous membrane.

℞ Extr. conii maculati (dissolved in rectified spirit), 3 grains.
Aquæ laurocerasi, 20 minims.
Potassii carb., 8 grains.
Aquæ destill., 1 oz.

M. f. inhal. To be used warm.
(*Lewin.*)

Belladonna spray for bronchitis and asthma.

℞ Extr. belladonnæ, 1 grain.
Aquæ, ½ oz.

M. f. sol. To be used with a Siegle's spray-producer every few hours.
(*Dr. Davies of Sherborne.*)

CHAPTER III.

THE TREATMENT OF CATARRHAL AFFECTIONS OF THE RESPIRATORY ORGANS: CHRONIC BRONCHIAL CATARRH.

CHRONIC BRONCHIAL CATARRH.—*Etiology*—Varieties: "Chronic Winter Cough"—"Dry" Catarrh—Pituitous Catarrh or Bronchorrhœa—Bronchiectasis—*Bronchitis Putrida*—Physical Signs—Indications for Treatment—Treatment of Ordinary Winter Cough—of Dry Catarrh—Alkaline Drinks and Sprays—Hot Aqueous Vapour for Inhalation—Mineral Waters—Ems—Apollinaris—Bourboule—Selters—Formulæ—Saline Aperients—Potassium and Sodium Iodide. BRONCHORRHŒA—Balsams and Gum Resins—Copaiba—Turpentine in Mixtures and Inhalations. INHALATION RESPIRATOR.—Derivatives from Turpentine—Terpine—Terpinol—Terebene—Tar—Creasote—Menthol—Balsams of Peru, Tolu, Benzoin, and Storax—Ammoniacum—Squills. BRONCHITIS PUTRIDA.—Antiseptic Inhalations—Santal Oil—Myrtol—Cod-liver Oil—Astringent Sprays for profuse Secretion—Acetate of Lead, Alum, Tannin, Perchloride of Iron, etc.—Senega and Quillaja—Value of an occasional Emetic—Ipecacuanha Spray—Mechanical Compression—Counter-irritation—Pneumatic Treatment—Climate—Mineral Waters—Treatment of Associated Constitutional Tendencies. Additional Formulæ.

THERE is, perhaps, no disease which is met with more frequently in Great Britain than **chronic bronchial catarrh.** The insular, humid, changeable climate is especially favourable to the maintenance of catarrhal conditions of the air-passages when once they are established.

The *chronic* form of bronchial catarrh is often the result of repeated *acute* attacks, or it is due to continued exposure to unfavourable meteorological conditions. It is often secondary to other diseases—to typhoid fever, to heart disease, to phthisis. It is sometimes caused by occupations which entail exposure to irritating dusts or gases. It is frequently associated with pulmonary emphysema, in the production of which it plays a predominant part. It is often encountered in connection with the gouty diathesis, as well as in association with rheumatism, scrofula, and syphilis. But whatever may be the *predisposing* causes, the two *exciting* causes apart from mechanical or chemical irritants, are almost invariably an inherited or acquired hyper-sensitiveness of the bronchial mucous membrane, and exposure to atmospheric vicissitudes.

It is met with at all ages, and is most troublesome to deal with and most dangerous at the two extremes of infancy and old age. It is sometimes comparatively slight, recurring regularly in severe weather in the form of what we call a chronic *winter* cough. There is also the "dry" form, the *catarrhe sec* of French authors, characterised by violent irritative cough, and scanty, tenacious expectoration difficult of expulsion. This is regarded by some as a "gouty" form. There is also the form, attended by abundant muco-purulent secretion, the "*catarrhe pituiteux*" of the French; the "bronchorrhœa" of other writers.

Occasionally chronic bronchial catarrh is accompanied by structural changes in the walls of the bronchi, leading to dilatation of these tubes, and to the formation of the so-called **bronchiectatic** cavities.

The stagnation and decomposition of bronchial secretion in these cavities may impart an offensive odour to the breath and to the sputa, *and* this may also arise from putrid ulceration of the bronchial mucous membrane, giving rise to what is termed *bronchitis putrida*, or fœtid bronchitis.

It is scarcely necessary to enumerate the familiar symptoms and physical signs of this very common malady: the cough more or less severe, the expectoration more or less abundant, the dyspnœa more or less grave, according to the extent of the diffusion of the disease or the presence of complications; the combination of good, often exaggerated, percussion resonance with diffused harsh respiration, and various sonorous *râles*, rhonchal and sibilant, crepitating and humid, or musical and dry, while gurgling *râles* are heard over the bronchial dilatations. In some cases there is notable emaciation.

The **indications for treatment** will vary with the nature of the case.

It is, in the first instance, important to remove all source of injury or irritation to the bronchial mucous membrane, in which the disease may have originated, or which may favour its continuance.

If it is dependent on occupation, change it. If on climate, let your patient seek a better one. Is it dependent upon the existence of some other disease or constitutional state, as heart disease, syphilis, scrofula, gout, etc., then our remedies must be selected with due regard to the original disease or diathesis.

There are other indications for treatment which may be deduced from the symptoms of the disease itself. These are:

a. To modify the morbid secreting action of the bronchial mucous membrane.
b. To promote the expulsion of the morbid secretions which tend to accumulate in the air-tubes.
c. To calm irritative cough.
d. To give tone to the enfeebled bronchial walls.
e. In fœtid bronchitis, to suppress the putrid decomposition of the bronchial secretions.

Little is needed in the way of medical treatment for those slight forms of bronchial catarrh which are almost habitual with some persons during the winter. General hygienic measures should be prescribed, such as sufficiently warm clothing, residence in dry and protected localities, and in well-warmed and well-ventilated apartments; avoidance of all exposure to draughts or chills of any kind. A respirator may sometimes be worn with advantage during cold, damp weather. The food should be light and nutritious, and the bowels kept open by gentle saline aperients. The most troublesome symptom in these cases is usually a more or less harassing cough on rising in the morning, with some expectoration which may at times be difficult to expel. The best remedy for this is 5 or 6 oz. of an alkaline water, such as Ems, Vichy, or Apollinaris with a little hot milk the first thing in the morning.

In cases of "**dry catarrh**" we meet with severe paroxysms of cough, attended by very scanty secretion, which is tenacious and sticky, and difficult of expulsion, and when it is expelled it is in the form of small pearly masses. The seat of this form of catarrh is in the smaller bronchi, and it is often associated with the gouty constitution. These cases are greatly benefited by the free administration of warm alkaline drinks, and the inhalation of hot saline alkaline sprays, or the steam of hot water.

The mineral waters of Ems, Apollinaris, Bourboule, and Selters are excellent for this purpose. Four to six ounces of Ems or Apollinaris water, with 2 ounces of hot milk or whey, should be taken four or five times a day, and the hot spray of these waters inhaled twice a day or oftener.

If these mineral waters are not available, a very good substitute is a mixture containing bicarbonate of soda and chloride of ammonium or sodium, and with this mixture we may often advantageously combine some pills containing tartarised antimony (or ipecacuanha) and morphine, the latter for the purpose of allaying the irritative, hyperæsthetic condition of the bronchial surface, the former to increase the amount and fluidity of the bronchial secretion, and so facilitate its expulsion.

The following prescription is useful:

℞ Sodii bicarbonatis	60 grains.
Ammonii (*vel* sodii) chloridi	30 ,,
Succi conii	2 drams.
Spiritus chloroformi	2 ,,
Aquæ	ad 6 oz.

M. f. mist. Two tablespoonfuls, with two of hot water, every four to six hours.

℞ Antim. tart. (*vel* pulv. ipecac., 1 grain)	$\frac{1}{6}$ grain.
Morphinæ acetatis (*vel* codeinæ, $\frac{1}{2}$ grain)	$\frac{1}{6}$,,
Extracti hyoscyami	2 ,,

M. f. pil. To be taken at bed-time.

Codeia should be preferred for gouty persons.

In the gouty this treatment should be combined with a saline aperient every morning, such as one or two teaspoonfuls of Carlsbad salts in hot water.

Potassium, sodium and ammonium iodides are valuable remedies in gouty forms of chronic bronchitis.

Potassium and sodium iodide also prove of much benefit when there is a tendency to asthma, and the bronchial secretion is tenacious and difficult of expulsion.

In cases of chronic bronchial catarrh with profuse secretion, or **bronchorrhœa,** the object of our treatment should be to modify the morbid secreting action of the bronchial mucous membrane. Several drugs are believed to possess this power in some degree; notably, certain "balsams" and "gum resins." Copaiba, turpentine, tar, creasote, the balsams of Peru and of tolu, ammoniacum, are members of this group of remedies.

Some of these drugs contain substances which are eliminated by the bronchial mucous membrane, and may thus exercise a local influence over the existing morbid conditions.

Copaiba is often given combined with tar in capsules, or according to the following formula:

℞ Copaibæ	2 drams.
Mucilaginis acaciæ	6 ,,
Spiritus chloroformi	30 minims.
Aquæ camphoræ	ad 6 oz.

M. f. mist. Two tablespoonfuls three times a day.

Turpentine is more agreeable and as efficacious. It may be prescribed in capsules or in the form of the confection of the B.P. A teaspoonful of this may be given for a dose, rubbed up with an ounce of peppermint water. Or it may be given as an emulsion, thus:

℞ Olei terebinthinæ	2 drams.
Mucilaginis acaciæ	2 oz.
Mist. amygdalæ	ad 6 ,,

M. f. mist. Two tablespoonfuls for a dose.

Turpentine is also well and readily administered by inhalation. A teaspoonful or two of the oil of turpentine may be vaporised from the surface of a hot-water plate containing boiling water, or it may be placed on the surface of hot water, and directly inhaled with the vapour of water from any suitable vessel, or twenty or thirty drops of spirit of turpentine may be added from time to time to the water in a bronchitis-kettle, when its vapour will be quickly diffused into the room; or the patient may wear a light perforated zinc **inhalation respirator,**[*] the sponge of which is charged from time to time with spirits of turpentine (Fig. 17).

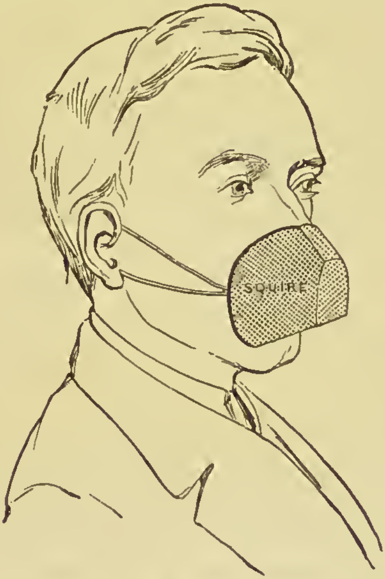

Fig. 17.—Dr. Yeo's Respirator.

Professor S. Solis-Cohen says this is "one of the most useful, as it is one of the simplest, devices for the inspiration of medicinal vapours."[†]

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[*] This little inhalation respirator was devised by the author, and is made by Messrs. Squire, 413, Oxford Street, London. Messrs. Wyeth, of Philadelphia, also make it in a slightly modified form.

[†] Hare's "System of Practical Therapeutics," vol. i. p. 829.

Various *derivatives* from turpentine have been used in the treatment of chronic bronchial catarrh.

Dujardin-Beaumetz commends highly *terpinol* and *terpine*. *Terpinol* is an oily substance with a jasmine-like odour; it is said when taken internally to be wholly eliminated by the respiratory passages. It is best given in capsules, five to ten daily, each containing a minim and a half; also in pills according to a formula to be found at the end of this chapter.

Terpine is a white crystalline body, "*bihydrate de térébenthène*," and it seems to act on the respiratory mucous membrane in the same way as turpentine, but it has the advantage of not disturbing the digestive organs. Lépine has used it with great success in cases of bronchorrhœa. It is only slightly soluble in alcohol, so it is best to give it mixed with alcohol and glycerine:

℞ Terpine	64 to 80 grains.
Alcohol	5 drams.
Glycerini	ad 2 oz.

M. f. mist. A teaspoonful in some aromatic water three or four times a day.

Murrell has commended *terebene* for the chronic form of winter cough. It may be given in capsules, or dropped on sugar, in doses of 5 to 20 minims; or it can be made into an emulsion with mucilage of tragacanth, or inhaled as a spray, or from the sponge of the little respirator just described.

Suckling tried terebene in a large number of cases of chronic bronchitis, and he came to the conclusion (1) that it greatly relieved the dyspnœa; (2) that its action was very variable, beneficial to some, prejudicial to others; (3) that it was by no means a specific for this disease.

Tar is another remedy for bronchial catarrh; it is frequently given in the form of capsules, or as *tar-water*, or in pills, and as an inhalation. It is of value in the treatment of chronic bronchial catarrh. It is an expectorant, as well as a tonic to the bronchial mucous membrane, and it has been suggested that it exerts its beneficial tonic effect on the respiratory mucous membrane in the act of its elimination, stimulating the epithelial elements and their cilia.

Tar-water can be made by stirring one part of tar with ten of water for fifteen minutes, and decanting. A wineglassful may be taken several times a day.

Tar can also be made into pills either with liquorice-powder or powdered gum acacia. Equal parts of tar and liquorice-powder may be mixed together and made into 5-grain pills, two or three of which should be taken three times a day.

Or the syrup of tar of the United States Pharmacopœia can be used. A stronger form can be obtained by washing the tar with an alkaline water or using *tinctura quillaja saponaria* it its preparation.

Tar may be *inhaled* in the form of spray by pulverising tar-water in a Siegle's spray-producer; it may also be used as a fumigation; for this purpose good ship's tar should be employed, to which 10 per cent. of carbonate of soda should be added to neutralise the pyroligneous acid contained in it which might be irritating to the respiratory passages. At first it is best to dilute the mixture with water, so as to get at the same time the emollient action of aqueous vapour on the part affected; subsequently the amount of water may be reduced, and at last the pure tar mixture with soda may be employed; this is simply poured on to a flat dish, and heated over a spirit-lamp. The tar vapours are evolved in the vicinity of the patient for a quarter of an hour or more at a time, once or twice a day, but it is desirable that the patient should remain all day in the room the air of which has been impregnated with tar vapour.

Much that has been said with regard to tar applies also to **creasote.** It can be given in the form of capsules, and then a few tablespoonfuls of warm milk or soup should be taken beforehand to avoid gastric irritation, or two tablespoonfuls of the creasote mixture of the British Pharmacopœia can be given three times a day. It can also be given in the form of pills each containing a minim, mixed with soap and crumb of bread.

Or it may be mixed with glycerine and any agreeable tincture, with a view of covering its taste, such as the following:

℞ Creasoti ... ... 32 minims.
Tincturæ chloroformi compositæ ... } āā 2 oz.
Glycerini ... ... }

M. f. mist. A teaspoonful in water or milk three or four times a day.

We have also given it mixed with cod-liver oil—2 minims of creasote with 2 drams of cod-liver oil—three times a day in cases of *bronchitis putrida* with remarkably good results. A mouthful or two of milk should be taken before and after the dose.

But creasote is especially useful for inhalation, and it can be very readily inhaled by means of the perforated zinc respirator already referred to (Fig. 17).

If there is much bronchial irritation as well as profuse secretion, the sponge of this inhaler can be charged with equal parts of creasote and ether, or creasote and chloroform; or if a less decided sedative is required, an excellent mixture for the purpose consists of equal parts of creasote and spirits of chloroform.

If it is desirable to combine the emollient effect of the vapour of water with that of creasote, the latter may be vaporised by dropping it on the surface of very hot water and their vapours inhaled together.

The employment of turpentine, tar, and creasote is especially indicated in cases of profuse bronchial secretion (bronchorrhœa), especially when the sputa are offensive owing to the existence of putrefactive processes in the air-passages, or the presence of bronchiectatic cavities.

The inhalation of **menthol** is useful in the same class of cases; it is said to allay cough as well as to promote expectoration.

The **balsams** of **Peru** and **tolu**, **benzoin** and **storax**, are also given in chronic bronchial catarrh to modify the morbid secreting action of the respiratory mucous membrane. The well-known tincture in the B.P. contains three of these—benzoin, storax, and tolu—and is often found of great service in lessening the amount of secretion, and diminishing the cough. It is necessary that this tincture should be rubbed up carefully with thick syrup or mucilage, so as to make an emulsion with the gum-resins it contains, or it will not mix with water, as :

℞ Tincturæ benzoini compositæ	2 drams.
Tincturæ tolutanæ	30 minims.
Oxymellis scillæ	3 drams.
Mucilaginis acaciæ	4 drams.
Vini ipecacuanhæ	30 minims.
Aquæ	ad 6 oz.

M. f. mist. Two tablespoonfuls three times a day.

This tincture may also be inhaled from hot water.

Another gum-resin of value in the treatment of the chronic bronchial catarrh of old people is **ammoniacum.** It is of much value as an expectorant in certain cases. It is given rubbed up with water as in the mistura ammoniaci of the British Pharmacopœia, or combined with squills, as in the following formula :

℞ Tincturæ camphoræ compositæ	3 drams.
Oxymellis scillæ	3 ,,
Misturæ ammoniaci	ad 6 oz.

M. f. mist. Two tablespoonfuls for a dose.

It is also one of the constituents of the pilula scillæ composita and the pilula ipecacuanhæ cum scillâ of the British Pharmacopœia.

Squill itself is a useful expectorant in many cases of bronchitis, especially in those cases which are intermediate between the acute and chronic forms. It is often combined with small doses of ipecacuanha and opium, as in the *Pilula ipecacuanhæ cum scillâ* of the B.P., of which 5 to 10 grains may be given at bed-time with much advantage in many cases of chronic bronchial catarrh.

The following formula* is a good one in those cases intermediate between the acute and chronic forms to which I have just referred :

℞	Tincturæ scillæ	2 drams.
	Tincturæ camphoræ comp.	3 ,,
	Spiritus ætheris nitrosi	3 ,,
	Liquoris ammoniæ acetatis	$1\frac{1}{2}$ oz.
	Aquæ camphoræ	ad 6 oz.

M. f. mist. Two tablespoonfuls every five or six hours.

In those cases in which the expectoration tends to become fœtid, cases of so-called **putrid bronchitis,** our treatment should be directed to preventing or arresting the decomposition of the bronchial secretion. Inhalations of antiseptic agents which act also as expectorants are specially indicated, such as turpentine, tar, creasote, carbolic acid, etc., after the manner already described. In such cases the inhalation of a spray of a 2 to 4 per cent. solution of carbolic acid is exceedingly useful. Inhalation of chlorine and iodine has also been recommended.

Da Costa has found *santal oil* of great value in these cases. He gives five drops three to five times a day. *Myrtol* has also been highly extolled in the treatment of putrid bronchitis. It is a volatile oil obtained from the leaves of the common myrtle; when taken internally it is eliminated chiefly by the lungs, and acts as an antiseptic and deodorant. It is given in capsules, each containing 2 minims, and two of these are prescribed every two hours, and its administration is attended by a diminution of the expectoration and a disappearance of the offensive odour. Tincture of eucalyptus, turpentine, creasote, or tar may also be given internally. In these cases it is also advisable to combine tonic remedies with expectorants, so as to maintain the general strength; we should also see that the patient has a nutritious diet. The patient's apartment should be well ventilated, and the air disinfected; for this latter purpose nothing is more agreeable than oil of eucalyptus or pinol. A mixture of one part of eucalyptus oil or pinol to six parts of rectified spirit may be diffused through the air by means of a hand-spray, or by dipping cloths in it and suspending them in the room. An atmosphere so charged with eucalyptus vapour has a decidedly soothing and soporific effect, a real advantage in many cases.

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* Brompton Hospital Pharmacopœia.

The following is an excellent tonic and expectorant for such cases :

℞	Ammonii carbonatis	40 grains.
	Tinct. nucis vomicæ	80 minims.
	Tinct. cinchonæ comp.	1 oz.
	Spiritus chloroformi	160 minims.
	Infusi senegæ	ad 8 oz.

M. f. mist. Two tablespoonfuls three times a day or oftener.

Or when a more decidedly bracing tonic is required we may give this :

℞	Tinct. ferri perchloridi	160 minims.
	Liquoris strychninæ	40 ,,
	Spiritus chloroformi	160 ,,
	Aquæ	ad 8 oz.

M. f. mist. Two tablespoonfuls three times a day.

We have already referred to the good results to be derived from the administration in these cases of cod-liver oil with creasote. Cod-liver oil is of very great value in the emaciating forms of chronic bronchitis with profuse secretion.

In these cases of **bronchorrhœa** the indications for treatment, as we have already seen, are

1. To endeavour to prevent the formation of the muco-purulent secretion, and
2. To promote its expulsion.

Now, besides the remedies directed to these ends already referred to, there are others to which we may have recourse. Some authors advise the direct application of astringent remedies to the mucous membrane of the air-passages in the form of *sprays;* fluids pulverised by means of a Siegle's spray-producer, containing in solution such astringent substances as acetate of lead (5 grains to the ounce), tannin (5 to 10 grains to the ounce), alum (5 to 10 grains to the ounce), perchloride of iron, rhatany, etc.

These remedies have been found useful in the after-treatment of cases of bronchorrhœa and putrid bronchitis. After the fœtor of the sputa, and the decomposing processes in the bronchial tubes upon which it depends, have been arrested by antiseptic inhalations, these astringent sprays are useful to remove the swelling, serous infiltration, hyperæmia, and engorgement of the bronchial mucous membrane.

We must not forget to mention **senega**, a medicine deservedly held in high repute in the treatment of chronic catarrhal conditions of the air-tubes.

Recently it has been stated that the *quillaja saponaria* is a better expectorant than the *polygala senega*, and it is said to be better tolerated by patients. It calms the cough as well as promotes expectoration. A decoction may be made by boiling 1½ dram of quillaja bark in 8 ounces of water, and sweetening with syrup. One or two tablespoonfuls should be given at a time.

The following is a good stimulating expectorant in cases of chronic bronchial catarrh with profuse, stringy, adhesive secretion such as is often met with in aged people.

℞ Ammonii carb.	40 grains.
Sodii bicarb.	40 ,,
Tinct. camphoræ comp.	4 drams.
Spr. chloroformi	160 minims.
Infusi senegæ	ad 8 oz.

M. f. mist. Two tablespoonfuls every five or six hours, with two tablespoonfuls of hot water; the hot water materially increases its expectorant power.

The addition of 5 to 10 grains of ammonium chloride to each dose of this mixture often promotes its expectorant effect. This salt may also be vaporised and inhaled with advantage.

It will be noted that this mixture contains a small quantity of opium (in the compound tincture of camphor), but it is a very small quantity, only one-eighth of a grain in a dose, for it is necessary to be very cautious in the use of opiates, in such cases. They are often extremely badly borne by old people, for, by diminishing the sensibility of the bronchial mucous membrane, the efforts of coughing are diminished, and the patient may fall asleep, never to wake again ; for in this sleep the mucus accumulates in the air-passages, the access of air to the air-cells is more and more interfered with, carbonic acid accumulates in the blood, and the patient dies poisoned by it. It is essential always to bear this in mind in treating the coughs of aged persons.

It is well also to remember the value of an occasional **emetic** in those cases of chronic bronchial catarrh with profuse suffocative secretion. The mechanical compression which the lungs undergo in the act of vomiting not only tends to the expulsion of the mucus accumulated and retained in the air-passages, but it also relieves pulmonary engorgement by simultaneous compression of the blood-vessels.

We have not yet referred to the method of treating chronic bronchial catarrh *by inhalation* of the *spray of ipecacuanha wine*,* so strongly advocated by Ringer and Murrell, and we must admit that we have not been impressed with its superiority to other remedies, while its application is undoubtedly more troublesome. It is best to dilute the wine with twice as much warm water at first, afterwards it may be used stronger. The quantity used daily varies from 80 minims to an ounce. The spray should be applied for ten minutes at a time, and it may be given with a Siegle or a Richardson's spray-producer.

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* Various other sprays have been used by Murrell : the simple tincture of lobelia, in doses of 1 to 3 drams in asthmatic catarrhal cases ; antimonial wine, pure or diluted with water, when the expectoration is tenacious and stringy ; potassium iodide in two per cent. solution, to relieve dyspnœa in chronic bronchial catarrh. We have ourselves seen a few applications of the spray of Bourboule water immediately relieve the cough of larnygo-bronchial catarrh with stringy, adhesive expectoration. The patent medicine *Spirone* is, according to Murrell, a two per cent. solution of iodide of potassium together with glycerine and acetone.

Although we do not share the opinion of many physicians, including Dujardin-Beaumetz, that none of the spray of a non-volatile fluid reaches the air-passages, yet we cannot see any room to doubt that much of the spray of the ipecacuanha wine, which passes into the pharynx, must find its way into the œsophagus, and be swallowed, and so produce its common expectorant effects.

It is true that the patients are told to spit out the fluid that accumulates in their mouths, but they cannot "spit out" the spray that reaches the cavity of the pharynx, and most of it should reach there in order to be drawn into the larynx in inspiration. A small quantity we do not doubt enters the upper part of the air-passages, but a far larger quantity must pass into the stomach.

With regard to the view held by many authorities to which we have just referred, that *none* of the spray of a non-volatile atomised fluid reaches the air-passages, apart from the fact that experimental observations have proved the contrary, we think their contention rests on what is a physical impossibility. When a fine spray intimately blended with the inspired air reaches the glottis, if their contention were true, every minute fluid particle would be turned back when it reached the glottis, and the air would be, as it were, *filtered* from the fine spray; but what agency is there that could possibly effect this at the entrance to the larynx?

Gerhardt* has strongly recommended the application of **manual compression** to the chest and abdomen in cases where it is difficult by ordinary means to procure free expectoration and unloading of the air-passages of the morbid secretions accumulated in them. He maintains that manual pressure on the external surface of the thorax and abdomen, applied during expiration, leads to the following good results :

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* Oertel's "Respiratory Therapeutics" (author's translation), p. 610.

1. Elevation of the diaphragm and a consequent reduction of the pulmonary dilatation.
2. Increase of vital capacity.
3. Diminution of the frequency of respiration.
4. Promotion of expectoration.

Cases in which the air-passages are occluded by viscid secretions, which the feeble muscular power of the patient is unequal to expel, are specially adapted to this mechanical treatment. The expiratory effort is directly strengthened by the associated manual pressure from without, and expectoration is also, indirectly, promoted by the more vigorous muscular activity resulting from increased supply of oxygen. Gerhardt mentions the case of a patient with large bronchiectatic cavities in the lower lobe of the left lung, in which by inhalations of turpentine he soon succeeded in removing the odour of the sputa, but the expectoration was small, and physical examination showed that the cavities remained for several days together constantly filled. He then endeavoured to promote and increase the expiratory effort mechanically by placing the patient on his right side, and daily employing manual pressure, by which means he succeeded in preventing the retention of the sputa.

Stokes estimated highly the effect of **counter-irritation** and revulsive treatment in chronic bronchial catarrh, and our own experience confirms his view. Stokes used to order a large portion of the chest to be sponged daily with a liniment composed of spirit of turpentine and acetic acid, so as to keep *up* an erythematous state of the skin. He thought that, besides the counter-irritation thus produced, some of the ingredients were absorbed by the surface.

No doubt the vapour of the more volatile constituent (turpentine) may be inhaled, and thus act locally on the bronchial mucous membrane. Patients themselves learn the value of these embrocations, and ask that they may be renewed. The linimentum terebinthinæ of the B.P. is a useful form, to which may be added, in the cases of scrofulous children, a dram or two of tincture of iodine to the ounce. The linimentum terebinthinæ aceticum (B.P.) is also very valuable; it contains equal parts of oil of turpentine, acetic acid and camphor.

The linimentum crotonis is likewise useful, as a revulsive, in some obstinate cases of chronic bronchial catarrh; the disadvantage attending its use is that it brings out an unsightly eruption of the skin, which may be avoided by diluting with twice its bulk of linimentum saponis.

The following is the formula for Stokes' embrocation:

℞ Spiritus terebinthinæ	3 oz.
Acidi acetici	$\frac{1}{2}$,,
Vitelli ovi	1 ,,
Olei limonis	1 dram.
Aquæ rosæ	6 oz.

M. f. embroc.

We must now consider, briefly, the value of **alterations of atmospheric pressure** in the treatment of chronic bronchial catarrh. This "pneumatic" method of treating chronic catarrh of the air-passages is more common in other European countries than in England, and most of the large cities and many health resorts on the Continent possess "pneumatic institutions" for the treatment of pulmonary affections by alterations of atmospheric pressure.

Various portable apparatus for this purpose,* notably, one devised by Waldenberg and another by Schnitzler, are also in use in Germany and Russia.

The "Pneumatic Chamber,"* in which the patient remains for some time, is chiefly employed for inspiration of compressed air; but by means of suitable arrangements he can be made to *inspire* compressed air and *expire* into rarefied air. So, also, by means of the portable apparatus mentioned, he can either *inspire* compressed or rarefied air, or *inspire* the former and expire into the latter.

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* These are fully described in the author's translation of Oertel's "Respiratory Therapeutics," already referred to.

The compressed air can also be made, by a slight addition to the apparatus, to flow through solutions of tar, creasote, eucalyptol, pinol, etc., and so become impregnated with vapours having a specific action on the bronchial mucous membrane.

It has been found that chronic bronchial catarrhs, even when obstinate and of long standing, are favourably influenced by pneumatic treatment. The pressure which compressed air exerts upon the swollen and hyperæmic respiratory mucous membrane lessens the calibre of its vessels and reduces the afflux of blood, while it promotes the efflux of blood and the fluids of the tissues, and in this way diminishes the swelling.

This diminution of the flow of blood to the mucous membrane and promotion of the efflux of fluids from it lessens the amount of secretion and widens the lumen of the tubes, giving freer passage to the in-flowing air, and thus increases the amount of air that can enter and leave the air-cells, and greatly aids pulmonary ventilation.

If there is but little secretion in the bronchi, and expectoration is difficult, while the tubes remain permeable to compressed air, then this air of higher tension rushes into the partially collapsed air-cells beyond the tubes, and thus imparts increased expulsive power, and facilitates expectoration.

Expectoration is also promoted by expiration into rarefied air, as by a simple physical process it removes hindrances to the outflow of air from the air-passages. It is not needful here to enter more fully into the theory of pneumatic treatment, but those who have had the largest opportunities of watching its results maintain that its beneficial effect in the majority of cases of chronic bronchial catarrh is permanent, that the catarrh is often entirely cured, and, even in incurable cases, dependent on some more deeply seated pulmonary lesion or cardiac affection, it is greatly alleviated.

At Reichenhall, near Salzburg, a very complete establishment exists for the treatment of respiratory affections in the Pneumatic Chamber.

The influence of **climate** in the alleviation, as well as in the causation, of chronic bronchial catarrh is universally known.

Those who suffer habitually from bronchial catarrh in the winter should, if possible, pass that part of the year in a climate where they may be exposed as little as possible to sudden changes of temperature, to chilling fog and mist, and to cold winds, and where they can get, without danger, a certain amount of exercise in the open air with plenty of sunshine.

The choice of any particular place is often determined by considerations of convenience, expense, or society. In England the best wintering-places for most cases of chronic bronchial catarrh are Torquay, Falmouth, Tenby, Penzance, Bournemouth, the Undercliff in the Isle of Wight, and St. Leonards.

But a drier and warmer winter climate than can be obtained in England is advisable in many cases, and for these we can choose from the various resorts on the Western Riviera, one of the best of which is Mentone ; or, if we consider the climate of the Riviera too exciting, we may select Algiers or Tangier, Orotava, or Las Palmas ; or, if we wish a very dry climate, there is Egypt and the Nile.

Madeira, Huelva, Malaga, Ajaccio, Palmero, Corfu, and many other places, offer also suitable winter quarters for the catarrhal subject. Perhaps the best for the majority of patients is Madeira, and it is now accessible by the fast Cape steamers in three days and a few hours.

Some German physicians prefer the more bracing but dry and sunny climate of Meran and Arco for their catarrhal patients in winter. At Meran treatment in the Pneumatic Chamber can be obtained, and in the appropriate seasons the grape or milk or whey cures can be had.

A course of **mineral waters** is often prescribed with advantage for sufferers from chronic catarrhal affections of the air-passages.

In France it is very common for such patients to be sent during the summer months to a sulphur * spa in the Pyrenees.

The French physicians are fond of dividing their catarrhal cases into three classes—the scrofulous, the arthritic (or rheumatic and gouty) and the dartrous. By the "dartrous" they mean constitutions prone to cutaneous eruptions. This classification has always appeared to us somewhat artificial, but they found upon it indications for the application of their different mineral springs to individual cases.

The arthritic or gouty cases are sent to Eaux Bonnes, Cauterets, or St. Sauveur in the Pyrenees, or to St. Honoré in the Department of Nièvre; if the catarrh is irritative and congestive, to Mont Dore, La Bourboule, or Plombières. The scrofulous are sent to Barèges in the Pyrenees, to Aix in Savoy, or the adjacent Challes, or to Uriage. The "dartrous" or "herpetic" are sent to La Bourboule or Royat.

The German physicians, on the other hand, consider those mineral springs which contain chloride of sodium in small quantity, or, still better, chloride of sodium combined with carbonate of soda, and containing some free carbonic acid, as specially suitable to the treatment of chronic catarrh of the air-passages.

Ems is pre-eminently the spa for this purpose, as it contains both chloride of sodium and carbonate of soda in small quantity. *Neuenahr* has somewhat similar properties. *Soden*, near Homburg, is also the type of a weak chloride of sodium-water, containing free carbonic acid, and it deservedly enjoys a great reputation in Germany for these cases.

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* Sulphur in 5- to 10-grain doses three times a day was recommended by Graves in the treatment of severe chronic bronchitis with abundant expectoration. He maintained that it lessened the amount of secretion and facilitated its expulsion.

Reichenhall offers salt springs, and "*salines*" where patients can promenade and inhale the emanations from the "graduation houses," as well as facilities for pneumatic treatment.

Weissenburg, near Thun, in Switzerland, with a hot sulphate of lime spring, and a moderate elevation, is considered by the Swiss physicians an excellent summer resort for sufferers from chronic catarrh of the air-passages.

When chronic bronchial catarrh occurs in obese middle-aged people who are free livers, a course of some more active mineral spring is indicated, and such patients derive advantage from a few weeks' treatment at Kissingen, Marienbad, or Carlsbad.

In all these health resorts the various kinds of baths available enable the physician to submit his patient, if he wishes, to those "repeated energetic sweatings" of which Niemeyer speaks so highly, powerful revulsion to the skin being undoubtedly an efficient means of relieving bronchial congestion.*

After one of these courses, which, it must be remembered, are only taken in the warm season, it is usually advisable to spend two or three weeks in some moderately elevated, bracing mountain resort, and amongst *pine*-forests, such as may be found in great numbers in the Black Forest, or in Switzerland.

If, as has already been said, the bronchial catarrh is associated with the existence of some other disease or constitutional state, we must not lose sight in our therapeutic efforts of the original disorder.

In the case of *scrofulous* children, we must look carefully to the general nutrition, give cod-liver oil, enjoin residence at the sea-side, the use of salt-water baths, free exercise in the open air in suitable weather, and mix some iodine with our embrocations.

In these cases the syrup of the iodide of iron is very useful, and it may be combined with cod-liver oil. *Hypophosphite of lime* is also often of remarkable value in treating the chronic bronchial catarrh of children and young people.

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* For detailed descriptions of these resorts, see the author's "Climate and Health Resorts," new edition.

In the gouty, as we have already pointed out, alkaline waters, saline purgatives, potassium iodide, and ammonium chloride are the best remedies, a few doses of colchicum being occasionally required. Opiates are to be avoided.

In cases associated with a tendency to cutaneous eruptions, arsenic will be useful.

If there is a well-marked syphilitic taint, we should of course employ iodide of potassium.

When chronic bronchial catarrh is a complication of heart disease, we must enjoin strict repose in a warm but well-ventilated apartment, we must give supporting food and medicines; and some form of alcoholic stimulant is of great value. In cases of mitral stenosis, digitalis will be helpful, and in feeble anæmic cases it may be combined with iron.

It is especially necessary in these cases to obtain free and regular evacuations from the bowels, for by unloading the intestines the descent of the diaphragm is facilitated, and any derivation of fluid from the portal venous system tends, indirectly, to relieve the engorgement of the right side of the heart.

A very useful form of aperient for such patients, which is efficacious without being depressing, is a pill of 2 or 3 grains of watery extract of aloes, and ½ or ¾ of a grain of ipecacuanha powder at bed-time, followed the next morning by 1 or 2 teaspoonfuls of Carlsbad salts in a tumblerful of hot water.

ADDITIONAL FORMULÆ.

Mixture for chronic bronchitis with emphysema.

℞ Ammonii carb., 40 grains.
Tinct. nucis vomicæ, 80 mins.
Tinct. scillæ, 4 drams.
Infusi serpentariæ ad 8 oz.

M. f. mist. Two tablespoonfuls for a dose. (Digitalis should be added when there is dilatation of right side of heart.) (*Fothergill.*)

"Routine" mixture for chronic bronchitis.

℞ Ammonii carbonatis, 24 grs.
Tinct. scillæ, 2 drams.
Tinct. camph. comp., 2 drs.
Infusi senegæ ad 8 oz.

M. f. mist. Two tablespoonfuls for a dose. (*Iodide of potassium* is added if expectoration is difficult; *lobelia* if there is much dyspnœa.) (*Suckling.*)

Expectorant mixture in chronic bronchitis of old people.

℞ Ammonii chloridi, 1 oz.
Tinct. camphoræ comp., 1 oz.
Mist. ammoniaci ad 20 oz.

M. f. mist. A tablespoonful four times a day in water. (*Whitla.*)

Another.

℞ Ammonii carb., 80 grains.
Tinct. camphoræ comp., 6 drams.
Tinct. senegæ, 4 drams.
Infusi senegæ ad 8 oz.

M. f. mist. One tablespoonful in a little water four times a day. (*Whitla.*)

Mixture for chronic bronchitis and bronchorrhœa.

℞ Extr. eucalypti fluid., 1 oz.
Ammonii chloridi, 2 drams.
Extr. glycyrrhizæ, 2 drams.
Glycerini, 3 oz.

M. A teaspoonful (in water) four to six times a day. (*Bartholow.*)

Expectorant in bronchial catarrh.

℞ Tinct. sanguinariæ, 1 dram.
Tinct. lobeliæ, 1 dram.
Vini ipecac., 2 drams.
Syrupi tolutani, ½ oz.

M. A teaspoonful every three hours. (*Bartholow.*)

Mixture for bronchorrhœa.

℞ Bals. copaibæ, 2½ drams.
Pulv. gum. acaciæ, 2½ drams.
Syrupi menthæ, 5 drams.
Aquæ menthæ ad 6 oz.

M. f. mist. Two tablespoonfuls night and morning. (*Bamberger.*)

Mixture for "dry" chronic bronchial catarrh.

℞ Potassii iodidi, 35 grains.
Potassii bicarb., 4 drams.
Ammonii chloridi, 2 drams.
Liquor. morphinæ hydrochl., 1 dram.
Aquæ chloroformi ad 8 oz.

M. f. mist. A tablespoonful every four or six hours, or a teaspoonful every two hours. (*Whitla.*)

Or

℞ Apomorphinæ hydrochl., 2 grains.
Codeinæ, 3 grains.
Vini ipecac., 6 drams.
Glycerini et aquæ ad 3 oz.

M. f. mist. A teaspoonful every three hours. (*Whitla.*)

Potassium citrate syrup as an expectorant in chronic bronchitis.

℞ Potassii citratis, 1 oz.
Succi limonis, 1½ oz.
Syrupi ipecac., ½ oz.
Tinct. camphoræ comp., 3 drams.
Syrupi, 3 oz.

M. f. syrup. A dessertspoonful every two hours. (*Thérap. Gaz.*)

Mixture of ammonium chloride as an expectorant in chronic bronchitis.

℞ Ammonii chloridi, 1½ dram.
Extracti glycyrrhizæ, 1½ dr.
Glycerini, ½ oz.
Mucilag. acaciæ, 2 drams.
Syrupi, 2 oz.
Aquæ ad 6 oz.

M. f. mist. A dessertspoonful or two every two hours.
(*Thérap. Gaz.*)

Creasote pills for chronic bronchial catarrh.

℞ Creasoti, 12 minims.
Pulv. saponis, 15 grains.
Micæ panis, 30 grains.

M. et divide in pil. 12. One or two three times a day.
(*Whitla.*)

Iodine and tannin as a "bronchial tonic" in chronic bronchitis.

℞ Iodine, 2½ grains.
Alcohol, ½ dram.
Syrupi krameriæ, 5 oz.

M. f. syrup. A tablespoonful for a dose.
(*Dujardin-Beaumetz.*)

Mixture of extract of geranium in chronic bronchitis and bronchorrhœa.

℞ Extracti geranii maculati fluid., 1½ dram.
Tinct. nucis vomicæ, 1 dram.
Tinct. sanguinariæ canad., 1 dram.
Syrupi simp. ad 2 oz.

M. f. syrup. A teaspoonful every four hours. (*Shoemaker.*)

Syrup of tar in chronic bronchitis and winter cough.

℞ Syrup. picis liquidæ (U.S.P.), 1½ to 3 oz.
Syrup. pruni virginianæ, 1 oz.
Liq. apomorphinæ (B.P.), 36 minims.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful every three hours. (*Murrell.*)

Terpene mixture for chronic bronchial catarrh with profuse secretion.

℞ Terpene, 7½ grains.
Alcohol, 5 drams.
Syrup. catechu, 1 oz.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every three hours.
(*Dujardin-Beaumetz.*)

Mixture for rheumatic bronchitis.

℞ Sodii salicylatis, 6 drams.
Glycerini, 4 drams.
Vin. colchici rad., 6 drams.
Syrupi scillæ comp., 1½ oz.
Tinct. opii camphoratæ, 2 oz.

M. f. mist. A teaspoonful in a little water every three or four hours.
(*Prof. Davis, M.D., Chicago.*)

Inhalation for bronchorrhœa and bronchitis putrida.

℞ Acidi carbolici, 30 minims.
Tinct. opii camphoratæ, 3 oz.

M. A teaspoonful to be inhaled freely from half a pint of hot water. (*Prof. Davis.*)

Inhalations for bronchorrhœa.

℞ Acidi carbolici, 8 minims.
Ol. pini pumilionis, 20 mins.
Aquæ ad 1 oz.

M. To be diffused from the surface of water kept boiling.
(*Dr. R. Lee.*)

Antiseptic inhalation for putrid bronchitis.

℞ Thymol, 1 dram.
Acidi carbolici, 2 drams.
Creasoti, 2 drams.
Spr. chloroformi, 1 oz.
M. f. inhal. (*Whitla.*)

Pills for chronic bronchitis.

℞ Pulv. senegæ, 1 dram.
Pulv. ipecac., 7½ grains.
Ol. terebinth., 1 dram.
Pulv. althææ, q.s.
Mucilag. acaciæ, q.s.

M. f. pil. 50. (To be kept in orris powder.) One three or four times a day. (*Bamberger.*)

Compound ammoniacum pills for chronic bronchial catarrh.

℞ Pulv. g. ammoniaci, 30 grs.
Extract. scillæ, 20 grains.
Morphinæ hydrochlor., 1½ gr.

M. et divide in pil. 20. Two to four of these pills may be taken in the day.
(*Von der Corput.*)

Compound tar pills for chronic bronchial catarrh.

℞ Picis, 18 grains.
Pulv. benzoini, 18 grains.
Pulv. ipecac. comp., 9 grs.

M. f. pil. 12. One or two three times a day.
(*N. Guéneau de Mussy.*)

Terpinol pills for chronic bronchial catarrh.

℞ Terpinol, 1½ grain.
Sodii benzoatis, 1½ grain.
Syrupi, q.s.

Ut f. pil. Three or four of these pills are given three times a day. (*Dujardin-Beaumetz.*)

Terpine pills.

℞ Terpine, 30 grains.
Sacchari albi, q.s.
Acaciæ gummi, q.s.

Ut f. pil. 20. One thrice daily, immediately after food.
(*Wyss.*)

Inhalation in chronic bronchial catarrh.

Equal parts of pure terebene, oil of santal wood, and oil of cubebs, mixed with liquid vaseline, and pulverised in one of Semple's atomisers.
(*Murrell.*)

CHAPTER IV.

THE TREATMENT OF ASTHMA (SPASMODIC ASTHMA, BRONCHIAL ASTHMA) AND EMPHYSEMA.

The Essential Nature of an Asthmatic Paroxysm—Two Forms, the *Spasmodic* and the *Catarrhal*—Therapeutic Observations throw Light on its Pathology—Description of the Paroxysm—Auscultatory Signs—Asthma a Respiratory Neurosis. *Treatment* of the *Paroxysm*—Morphine—Atropine—Chloroform—Ether—Nitrite of Amyl—Iodide of Ethyl—Pyridine—Chloral Hydrate—Fumigation—Cigarettes—Tobacco—Nitre Papers—Stramonium—Datura Tatula—Cigarettes d'Espic—"*Carton Fumigatoire*"—Himrod's and other Cures—Arsenical Cigarettes—Coffee and Caffeine—Ice—Ammonia Vapour—Emetics—Potassium Iodide—Belladonna—Lobelia—Euphorbia Pilulifera—Antipyrin—Quebracho—Cannabis Indica—Grindelia—Conium—Hyoscine—The Bromides—Hydriodic Acid—Strychnine—Arsenic—Dependence of Asthma occasionally on Naso-pharyngeal Disease—Electricity—Pneumatic Treatment—Inhalations of Oxygen—The Mont Dore Cure—The correct Pathology deducible from Therapeutic Observations—Prof. Fraser's Observations on the Action of the Nitrites—Climatic, Dietetic, and Hygienic Management. *Emphysema:* Causes—Indications for Treatment—Pneumatic Treatment. Additional Formulæ.

ASTHMA.

THE essential condition of an attack of **asthma** is the existence of a state of spasmodic contraction of the bronchial muscles—of those unstriped muscular fibres that have long been known to enter into the structure of the walls of the bronchial tubes, and to extend even to their finest ramifications. *Spasm* of these muscular fibres is the *essential* element in the asthmatic attack. In a case of purely *spasmodic* asthma, of the ordinary transitory character, this condition of bronchial spasm is a complete and simple explanation of the phenomena of the asthmatic paroxysm. But asthma is not always such a simple matter. In what is termed "*bronchial* asthma" the asthmatic attack is associated with *bronchial catarrh*, and the catarrhal condition seems frequently to bear a causative relation to the asthmatic paroxysm, as well as to intensify it and to render it less transitory and more continuous.

Clinically, then, we have to deal with two forms of asthma, the one *simply spasmodic*, the other spasmodic *also*, as its essential element is spasm, but *complex* also, as there is co-existent bronchial catarrh.

We have stated the case thus simply at the outset for the sake of clearness. These statements, however, have been the subject of much controversy—a controversy which we shall not be able altogether to avoid. The treatment of asthma is a remarkable illustration of the fact that a therapeutic observation is often an experiment in practical pathology, and is calculated, in some obscure morbid conditions, to throw great light on their true nature and causation. In such instances, the pathology of the morbid state under consideration can be more clearly and fully examined *after* we have considered the manner in which its phenomena are influenced, by the introduction of those modifying agencies which we sum up in the word "treatment."

A severe paroxysm of spasmodic asthma may be thus described :—

Suddenly, without any warning, often in the middle of the night, or between two and four in the morning, the subject of asthma wakes up with an attack of urgent dyspnœa upon him. In some cases premonitory signs are noticed which vary greatly in character. Some complain of flatulent dyspepsia as a forerunner of the attack ; others of languor, headache, depression, and sleepiness ; others of unusually high spirits ; and many notice a tendency to pass large quantities of pale urine of low specific gravity, as in hysteria and other emotional nervous states. Some complain of slight cough, and a feeling of irritation about the upper air-passages, and a slight sense of constriction in the chest before the onset of the paroxysm.

The dyspnœa usually increases rapidly in intensity, and we find our patient sitting up in bed with arms fixed, shoulders raised, and head thrown back on the pillows, which are piled up behind him to support him in this position; we find him gasping for breath, taking short, forced inspirations, followed by relatively prolonged, noisy, wheezing expirations.

He is unable to move, or even sometimes to articulate a single word. The extremities are cold, owing to the interference with the circulation which this pulmonary spasm presents, while the face is often covered with beads of perspiration.

If the attack occurs in the daytime, the patient will remain riveted in his chair in this same attitude, with his arms fixed and rigid, until the violence of the paroxysm subsides; or you may find him in the erect attitude, grasping some convenient support.

The countenance is sometimes pale and anxious, sometimes flushed and congested, sometimes dusky and livid.

The chest is usually distended and hyper-resonant on percussion, and the diaphragm is depressed. There is plenty of air in the lungs—too much, indeed—but it cannot get out and be renewed! On auscultation peculiar prolonged cooing, or whistling, or wheezing sounds may be heard, with varying intensity, all over the chest, especially during expiration.

If the attack is associated with the existence of bronchial catarrh, sonorous, sibilant, and crepitating *râles* will also be heard on auscultation.

As the attack comes to an end there is usually, *but not invariably*, a small amount of characteristic expectoration consisting of small, transparent, pearly pellets the size of a pea or smaller.

What is the nature of this remarkable paroxysm?

We regard asthma as a *respiratory neurosis*, and the asthmatic seizure as essentially a disturbance of respiratory innervation, what Trousseau called an "*epilepsy of the lungs*."

Those who admit the essentially nervous spasmodic nature of the asthmatic paroxysm are not all agreed as to the precise extent of muscular area over which the spasm extends. For some it is a spasm of the diaphragm chiefly—the diaphragm, it is said, is rigidly and convulsively fixed in its extreme inspiratory position; for others it is a spasm of all the inspiratory muscles—the diaphragm, the intercostals, scaleni, trapezii, and all the muscles that take part in inspiration; for others the spasm is limited to the *bronchial* muscles, the involuntary muscles that are found in the smaller bronchial tubes, and for them the asthmatic paroxysm consists in a spasmodic contraction of these muscles, diminishing the calibre of the smaller air-tubes, and resisting alike both the ingress and egress of air; finally, there are others who think that both these sets of muscles are affected, the bronchial muscles *within* as well as the inspiratory muscles without the lungs.

Such an attack as we have described, if unrelieved by any remedy, may last, with some variations in its severity, from two to six hours; the patient may then fall asleep, and awake perfectly well; or there may remain a slight tendency to wheezy and difficult respiration for a day or two.

Sometimes, however, the paroxysms will recur, with longer or shorter incomplete remissions, for four or five days (or nights), and then the attack will pass away and the normal state of health be re-established, and months, or even years, may elapse without any return.

During these intervals there may be no discernible evidence of the existence of any disease of the chest, unless the attacks have been numerous, and have recurred within comparatively short periods of time during many years; then, as you may suppose, these continued, repeated, and violent disturbances of the respiratory function lead to permanent injury and disease of the thoracic viscera; pulmonary emphysema and chronic bronchial catarrh become established, there is more or less constant dyspnœa on any exertion, and as age advances the right side of the heart dilates, and finally embarrassment of the circulation with tricuspid insufficiency and dropsy may lead to a fatal issue. But these latter conditions are the *consequences* of asthma—they are not asthma—the disease with which we are now concerned.

Sufferers from asthma, however, do not all have attacks of the severity of the one described ; attacks of minor severity are very common. The duration also of the severe attacks, in certain very bad cases, is much longer, and may continue with little intermission for many weeks.

Asthma then, we repeat, is a *respiratory neurosis*, attended with spasm of the bronchial muscles, preventing both the ingress and egress of air in respiration. In some cases it is associated with bronchial catarrh, in others it is not.

With these few preliminary observations, we are now in a position to enter on the consideration of the **treatment of asthma.**

And first, with regard to the treatment of the asthmatic paroxysm when it is established :

We know of no remedy so generally efficacious in cutting short a *severe* fit of asthma as **morphine** administered hypodermically, and we are accustomed to add a small dose of atropine to the morphine. We give from $\frac{1}{6}$ to $\frac{1}{3}$ of a grain of the acetate, or hydrochlorate of morphine, with $\frac{1}{120}$ or $\frac{1}{60}$ of a grain of the sulphate of atropine. A hypodermic injection of this kind will often subdue the most severe paroxysm of spasmodic asthma in a few minutes.

It is a remedy, however, which has to be used with great discretion, and which should be strictly reserved for the very severe paroxysms. It has this drawback, that it is not safe to leave it in the hands of the patient or his friends. It must be reserved for administration by the physician himself. Sooner or later, however, the patient acquires for himself the knowledge of the relief which an injection of morphine brings, and then he learns to apply it himself, and in this way the morphine habit becomes occasionally established.

It should *never* be employed in the bronchitic asthma of aged people, or whenever there are signs of co-existing profuse bronchial catarrh, unless the suffering from dyspnœa is extreme and other remedies have failed to give relief; and in that case only a small dose should be given, and its effects carefully watched.

The late Dr. W. E. Steavenson, of St. Bartholomew's Hospital, himself a sufferer from spasmodic asthma, in a valuable thesis written by him on this subject, speaking of suitable remedies for the paroxysm, observes:

"Above all in value I should place the hypodermic injection of morphia. This has never failed to relieve an attack in myself, and I have never seen it fail in other patients.

"The objection to it is that, if often used, the dose must be increased; but it is better to increase the dose of morphia than suffer the agonies of asthma.

"I have now used morphia for five years, but my attacks are so quickly relieved, and so reduced in frequency, that I have never yet had to increase the dose I commenced with, namely, $\frac{1}{6}$ of a grain."

Dujardin-Beaumetz* bears similar testimony. "Subcutaneous injections of morphine," he says, "with or without atropine, appear to me the most certain means of stopping an attack of asthma at its commencement. For my own part, I have very often seen such attacks disappear in ten or fifteen minutes after an injection of 5 to 10 milligrammes of hydrochlorate of morphine."

Riegel† bears testimony to the same effect.

The *inhalation of* **chloroform** is a favourite remedy with some to relieve the asthmatic paroxysm, and it is undoubtedly a valuable resource in many cases; but there are patients who have a great dread of inhaling chloroform, and its use should be reserved for those cases where there may be good reasons for avoiding the employment of morphine, and, when given, it should not be pushed to complete insensibility. Dr. Steavenson's personal experience was that it "never failed to subdue a paroxysm, but its effects were as evanescent as the drug."

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* "Clinique Thérapeutique—Traitement de l'Asthme," vol. i. p. 558. 5th edition. Paris, 1888.

† Ziemssen's "Cyclopædia."

Steavenson found **ether** in the form of Hoffman's anodyne often give temporary relief, and so would also chlorodyne.

The inhalation of **nitrite of amyl** also gives temporary relief; but its effect is evanescent, and in severe cases the improvement does not last more than ten or twelve minutes, when the dyspnœa gradually returns.

Two to five minims of nitrite of amyl should be dropped on lint and inhaled. It is best to use the glass capsules, each containing 3 to 5 minims, as it deteriorates and becomes almost inert on exposure to air. These capsules are usually enclosed in cotton-wool with a silk cover, so that when they are broken the liquid soaks through the covering, from which it can be inhaled. With regard to *nitro-glycerine*, we shall return presently to the subject of the influence of the nitrites generally on the asthmatic paroxysm, and its bearing on the pathology of asthma; and we may as well say now, by way of precaution, that the attacks of paroxysmal dyspnœa which occasionally come on in advanced stages of renal disease—the so-called cases of uræmic or renal asthma—must *on no account whatever be treated by opiates.* If you give opiates in any form in these cases, you may relieve the dyspnœic paroxysm, but it may be at the expense of your patient's life! Chloroform is the best remedy in these cases, or nitrite of amyl.

The inhalation of **iodide of ethyl**—10 to 15 minims on a piece of lint, held in the palm of the hand—has been strongly advocated by Professor Germain Sée, of Paris, for the relief of the asthmatic paroxysm, and we have found it useful in many cases of not great severity, and in cases associated with bronchial catarrh. Martindale's capsules of chloroform (10 minims) and iodide of ethyl (5 minims) may be used.

Professor Sée has also advocated strongly the inhalation of **pyridine** to relieve the asthmatic paroxysm. He considers it preferable to, and less dangerous than, the hypodermic injection of morphine. In young children it may be dropped (5 to 10 minims) on a handkerchief tied round the neck, and for adults a teaspoonful may be placed in a heated saucer, and inhaled three times a day, or it may be simply placed near the patient. It is said to lessen the sensibility of the vagus, and to diminish the excitability of the medulla. It quickly appears, after inhalation, in the urine. Patients often fall asleep after these inhalations. It modifies reflex sensibility, and the muscles are relaxed. Its unpleasant nauseating odour is a very great drawback to its use.

Chloral hydrate is another remedy in great favour with some physicians. It must be given in a full dose—30 to 40 grains—and its administration is frequently followed by partial, if not complete, subsidence of the paroxysm.

It does not, however, agree with some patients. Dr. Steavenson, for instance, says, "Instead of relieving me, it added to my already unhappy condition by inducing delirium!"

Moreover, it must be remembered that in some of the severest paroxysms the dyspnœa is so great that the patient cannot even swallow a dose of medicine!

In many instances the paroxysms of asthma, especially the less severe cases, can be arrested, or favourably modified, or more or less kept under, by **fumigations** of various kinds.

When the paroxysm is not so severe as to disable the patient from smoking, a convenient mode of inhaling the fumes of the remedies employed is by smoking cigarettes composed of or impregnated with these drugs. If the patient is unable to smoke, these remedies may be burnt close to him, and their fumes diffused through the air of his apartment.

Simply smoking *tobacco*, to those unaccustomed to its use, will occasionally subdue an attack; but its use is attended by the well-known nausea and faintness experienced by beginners in the use of the weed. Inhaling the fumes of **nitre paper,** *i.e.* paper which has been soaked in a strong or saturated solution of potassic nitrate, is a popular as well as very efficacious remedy in many cases. Paper so charged may be rolled up in the form of cigarettes and smoked; or it may be freely burnt in the patient's apartment. It is especially in the purely spasmodic form that these fumes are most useful. In most cases it is necessary to burn this paper very freely, so that the room may become filled with a dense cloud of these fumes.

Many persons who are subject to attacks of asthma keep nitre paper at hand in their bedrooms, and begin burning it on the first warning of the approach of an attack. We shall see hereafter that these fumes contain *nitrites.*

Most of the medicated cigarettes and powders which are sold for the relief of asthma contain **stramonium** or *belladonna*, or both; the former is a drug which has long maintained, and justly so, a very high position as a remedy for asthma.

Some of these cigarettes contain opium also. The *Datura tatula*, a plant closely allied to the *Datura stramonium*, is the basis of other of these remedies.

The celebrated *Cigarettes d'Espic* are said to be made of the following ingredients:

℞	Belladonna leaves	5½ parts.
	Hyoscyamus leaves	2¾ ,,
	Stramonium leaves	2¾ ,,
	Phellandrium aquaticum	1 part.
	Extract of opium	⅛ ,,
	Cherry-laurel water	q.s.

The dried leaves, stripped of their stems, are cut small, well mixed, and then moistened with the opium dissolved in the cherry-laurel water. The paper used for making the cigarettes is also soaked in an infusion of these leaves in cherry-laurel water. Usually in making these cigarettes a little nitrate of potash is added to the infusion to make them burn freely.

The fumes of stramonium at once relieve certain asthmatics, but they fail to do so in others—especially, it is said, in those who use tobacco habitually.

Some of the fuming-papers that are sold for the relief of asthma contain potassium iodide, and others potassic chlorate, as well as potassic nitrate. Huggins's ozone papers are said to be so composed.

The "*Carton fumigatoire*" of the French codex—a very useful preparation—is thus made: Take 7 ounces of grey unsized paper and 2 ounces of powdered nitre: take of powdered belladonna leaves, stramonium leaves, digitalis leaves, and lobelia leaves, each 75 grains: take of powdered myrrh and powdered oliban, each 150 grains. Tear the paper in pieces and soak it in water, then add the powders previously mixed, and pound and beat them all together. Then spread out the soft paste in tin moulds, and dry it in a stove. Finally, cut this quantity up into thirty-six pieces, each 6 centimètres long and 4 centimètres wide. One of these pieces is burnt in the patient's room.

Some of the powders sold as patent medicines, and now largely employed by asthmatics, are often very useful in relieving the dyspnœa, but they are used much too freely, and are apt to produce a seriously depressing effect on the heart.

This may certainly be said of "Himrod's Cure for Asthma" and of "Senier's green powder." Nowadays the bedrooms of most asthmatics are redolent of the penetrating and somewhat sickening odour of these powders.

It has been stated that Himrod's cure does not contain stramonium; it certainly contains a drug which causes dilatation of the pupils. It has also been stated that the following makes a good imitation of it:

℞ Lobelia, powdered	āā 1 oz.
Black tea, powdered	
Stramonium leaves, powdered	

Pour upon this mixture 2 oz. of a saturated solution of nitrate of potash, mix thoroughly, and dry.*

The fumes of *arsenical* cigarettes prove of great service to many asthmatics. They are usually made by dissolving 15 grains of arsenite of potash in half an ounce of distilled water, and saturating unsized paper with it. This is afterwards dried and cut up into twenty pieces, each of which is rolled up into a cigarette. The smoke from the cigarette must be drawn into the bronchial tubes by a slow inspiration.

Strong *coffee* is a popular and good remedy for the relief of asthma; it should, however, be taken on an empty stomach, for it is necessary that it should be very strong, and the tannin it contains, if taken on a full stomach (as Dr. Steavenson has pointed out) precipitates the peptones, and thus disturbs digestion, and may become another exciting cause of dyspnœa. Swallowing fragments of *ice* has also been known to allay a paroxysm.

But instead of coffee, **caffeine**, or the **citrate of caffeine**, is now extensively used in the treatment of paroxysmal neuroses, and we have found it of undoubted efficacy in the treatment of asthma, especially in preventing the attacks or in diminishing their severity. Two or three grains should be given with a little sugar of milk in a powder about an hour before bed-time, and again during the night if necessary; or it may be taken as a precautionary measure an hour before lunch or dinner.

It may also be given hypodermically made into a solution with sodium benzoate.

The *vapour of ammonia* is advantageous to some asthmatics, and cases are on record of persons, prone to these attacks, who have found an immunity from them when constantly exposed to an atmosphere containing ammonia, as in the air of stables.

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* Other formulæ will be found at the end of the chapter.

The use of **emetics** for the relief of the asthmatic attack has been highly commended by some, and we have seen very great benefit follow the unexpected emetic action of a hypodermic injection of morphine; but in such cases there is usually a co-existing bronchial catarrh, and the emetic effect is attended with the discharge of much stringy, tenacious mucus from the bronchi.

In asthmatic *children* an emetic of 20 grains of ipecacuanha will sometimes be of use by emptying an overloaded stomach, as well as by expelling catarrhal secretion from the air-passages.

In certain phases which asthmatics will sometimes present, such especially as the occurrence of almost continuous dyspnœa, with signs of *dry catarrh*—*i.e.* a good deal of irritative, hacking cough, and very little expectoration—we have found great benefit from the administration of small, nauseating doses of *tartar emetic*, together with small doses of morphia and potassium iodide.

The following we have found a useful prescription in such conditions:

℞	Antimonii tartarati	1 grain.
	Liquoris morphinæ hydrochloratis ...	2 drams.
	Potassii iodidi	40 grains.
	Spir. chloroformi	2 drams.
	Aquæ	ad 4 oz.

M. f. mist. One tablespoonful, with one of hot water, every three or four hours until relieved.

Apomorphia, $\frac{1}{10}$ of a grain given hypodermically, is a very certain emetic, when swallowing is impossible on account of the severity of the attack. It is said to cut short some paroxysms, but its very depressing effect must never be lost sight of.

Steavenson observed, in his own case, that the relief afforded by emetics *preceded* vomiting: "when the first sense of nausea and faintness is experienced the relief is immediate;" and he argued that that proved "conclusively the nervous character of asthma," the emetic acted through its power of relieving muscular spasm.

Iodide of potassium is one of the most reliable of remedies for asthma, both during the paroxysms and in the intervals. It may be given in 5- to 15-grain doses twice or three times a day, and one of these doses should be given at bed-time. In old cases of bronchitic asthma it is a good plan to give a small dose of the extract of stramonium with the iodide of potassium. The following is a very good formula :

℞	Potassii iodidi	5 to 15 grains.
	Extracti stramonii	$\frac{1}{6}$ to $\frac{1}{3}$ grain.
	Spir. chloroformi	... 20 minims.
	Spir. ammonii aromat. ...	... 20 ,,
	Aquæ	ad $1\frac{1}{2}$ oz.
	M. f. haust.	

This draught may be taken at bed-time only, or it may be taken more frequently according to the requirements of the case. The extract of stramonium is, however, often found a very uncertain drug. Different extracts seem to be of very unequal activity.

When the extract is good it usually gives rise, at first, to some unpleasant dryness of the throat and mouth, some disturbance of vision, and sometimes a little headache and loss of appetite. These effects worry some patients excessively, and they will often refuse to continue its use.

It is for these reasons that it is best to give the stramonium at night only, when its unpleasant effects can be to a great extent slept off!

Belladonna, when given alone, is not nearly so useful a remedy for asthma as stramonium. It is, however, commended in large doses ($\frac{1}{2}$ dram of the tincture) by some authors. It causes a most distressing sense of dryness in the throat, besides unpleasant disturbances of vision in many. *Combined* with other drugs, it enters into the composition of many remedies for asthma, and we have already pointed out how useful its alkaloid atropine proves when combined with morphine.

Some patients cannot take potassium iodide without suffering from lachrymation, frontal headache, and other signs of coryza; and in some it causes intense depression. In such cases you may give the *bromide* of potassium; and in some excitable, highly nervous subjects this salt has been found useful in keeping off the asthmatic paroxysm, when given in 10-grain doses twice or three times a day.

The evidence as to the value of **lobelia** in relieving the asthmatic paroxysm is not altogether satisfactory. It is a very uncertain remedy, and it should not be had recourse to until other more reliable remedies have failed. Besides its uncertainty, its effects are often very disagreeable, causing quite an alarming sense of faintness and sickness. Still, in the treatment of the paroxysm of asthma, we must not altogether discard any resource which has been found efficacious by trustworthy observers, and some appear to value it highly. It should be given in small doses frequently (10 minims of the tincture every ten minutes until it produces some decided effect). As soon as nausea is experienced it should be stopped, and only repeated at intervals of four to five hours, supposing its effect is beneficial. By giving it in this tentative manner the dose appropriate to each individual will be ascertained. It is best suited to the treatment of the bronchitic form of asthma. Recently Nemés has commended its active principle, *Lobeline*, in doses of 1 to 4 grains, as an efficacious remedy for asthma, without producing the nauseating effects of lobelia.

We know little at present of the real value of *Euphorbia pilulifera*, except that its effects in bronchitic asthma have been highly praised by some Australian and American physicians. It is said to have a slightly narcotic effect, and to induce sleep in the asthmatic sufferer. It is given in the form of fluid extract in doses of ½ dram to 1 dram in water;

or as a decoction, made by putting 1 ounce of the fresh or ½ ounce of the dry plant into two quarts of water, and simmering down to one quart. A wine-glassful of this is given at bed-time, and twice during the day. Dujardin-Beaumetz observes that he has occasionally seen good effects from its use in asthmatic dyspnœa. He gives small doses, three to ten drops of a tincture.

Antipyrin has been stated to give complete relief in an asthmatic paroxysm in ten minutes. The dose given was 30 grains. It has also been given in doses of 10 to 15 grains three times a day.

Quebracho has been found useful to relieve the dyspnœa of mild bronchitic cases, but it exercises a depressing action on the heart, and is not suitable to those numerous cases in which there exists cardiac dilatation and feebleness.

Cannabis indica has also been given in asthma, but there is very little evidence of its having any great influence over the paroxysms.

Grindelia, the fluid extract of the leaves of *Grindelia robusta*, in doses of 10 minims to 1 dram, has been highly extolled by some American physicians for the relief of spasmodic asthma. Bartholow says "few cases fail to be relieved at once." He recommends the fumes of the burning plant to be inhaled—the plant having been previously steeped in a solution of nitre, and dried. Cigarettes are also made from the leaves. This drug has not, however, been found so efficacious in Great Britain, and we notice in the prescription Bartholow gives for its employment he combines it with lobelia, belladonna, and iodide of potassium! The latter is certainly one of the most reliable remedies we possess for the treatment of asthma, and it would be impossible to refer any benefit which might follow the use of this mixture to the fact that it contained some grindelia!

Conium, in full doses, has been advocated for the relief of this, as well as of other spasmodic affections.

Hyoscine has also been found useful by some practitioners.

The *bromides* of potassium, sodium, and ammonium have been given frequently in cases of asthma. They are too slow in their action to be of much use in the treatment of the paroxysm, but they are certainly useful during the intervals, especially in highly neurotic subjects, and appear to diminish the frequency of the attacks. We should strongly recommend their employment on the first incidence of spasmodic asthma in young people.

The *syrup of hydriodic acid*, made by Gardner, of New York, is largely used in America as a substitute for potassium iodide in the treatment of asthma, chronic bronchitis, and other diseases in which the use of iodine is indicated. The acid itself is very unstable and readily decomposes into free iodine and water; but this syrup is said to be fairly stable, except that in hot weather it must be kept in a cool place, and in the dark. A fluid ounce of the syrup contains 6·66 grains of iodine. Shoemaker says, "Its action will be found more efficient in equivalent doses than iodide of potassium, while it produces none of the unpleasant effects of the latter." Any decomposition is at once indicated by change of colour owing to the liberated iodine, and it is then unfit for use.

The dose is 20 to 30 minims at first, well diluted with water, and taken about half an hour or an hour before meals (it must not be taken *after* meals), and this dose may be gradually increased to two teaspoonfuls.

Strychnine alone or, better, combined with *atropine*, in hypodermic injections, has been found very useful in keeping off the paroxysms. At first a daily dose of $\frac{1}{32}$ grain of strychnine and $\frac{1}{160}$ grain of atropine should be given, and this may be slowly increased to $\frac{1}{24}$ grain of strychnine and $\frac{1}{100}$ grain of atropine. If the amelioration is maintained these medicines should be discontinued. We have given with benefit the *arseniate of strychnia* in $\frac{1}{32}$-grain doses, three times a day, in pills with extract of valerian.

Another most valuable remedy in the treatment of asthma, especially the bronchitic form—*i.e.* the combination of a tendency to paroxysmal dyspnœa with chronic bronchial catarrh—is **arsenic.** We have frequently obtained most excellent results from the long-continued administration of this drug. The following is a good formula :

℞ Liquoris arsenicalis	36 minims.
Spir. ammoniæ aromat.	4 drams.
Spir. chloroformi	2 ,,
Aquæ camphoræ	ad 6 oz.

M. f. mist. One tablespoonful three times a day an hour after food.

Or arsenious acid may be given in combination with quinine and atropine, as in the following prescription of Sebert's :

℞ Quininæ muriatis	60 grains.
Acidi arseniosi	1 grain.
Atropinæ sulphatis	$\frac{1}{2}$,,
Extracti gentianæ	60 grains.

M. et divide in pil. 60. One to four daily.

Another convenient mode of giving arsenic in the intervals between the attacks is in pills of sodium arseniate and nux vomica :

℞ Sodii arseniatis	$1\frac{1}{2}$ grain.
Ext. nucis vom.	24 grains.

M. et divide in pil. 24. One twice a day, an hour after food.

At the same time 4 to 6 oz. of Bourboule water, which contains arseniate of soda, should be drunk *warm* night and morning.

It has been suggested that the asthmatic paroxysm is frequently dependent on *disease* of the **nasal** and **pharyngeal** *cavities*, such as the presence of polypi or hypertrophic and catarrhal conditions, or other morbid states, and that more attention should be given to the investigation of these cavities in considering the etiology and treatment of asthma. The removal of naso-pharyngeal polypi and the radical treatment of diseased conditions of the nasal and pharyngeal cavities have constantly been attended by disappearance of asthmatic attacks.

In all cases, and especially those occurring in children and young people, the nasal fossæ should be thoroughly explored, as well as the throat; enlargement of glandular and other structures of the throat and neck by compressing the vagus or its branches may be concerned in the production of the asthmatic paroxysm; the possibility also of *enlarged bronchial glands* acting as a source of irritation must not be overlooked, especially when asthmatic attacks follow acute infective diseases attended with much bronchial catarrh, as measles, etc. The remarkable curative effects of the iodides and of arsenic in many cases of asthma suggest the possibility of these drugs acting through their well-known influence over glandular inflammation and hypertrophy.

Dieulafoy has recommended that in the treatment of asthma, besides the use of potassium iodide (15 to 30 grains daily) and sodium arseniate ($\frac{1}{20}$ grain after the principal meal), the nasal cavities should be painted, as high up as possible, with *a 5 per cent. solution of cocaine*, and that the same should be sprayed into the mouth and nose for four or five minutes, and, if these measures fail to avert the attack, cocaine should be injected hypodermically and *pyridine* (one to twelve drops) inhaled. This method has clearly in view the removal of a hyperæsthetic state of the nasal and pharyngeal surface.

We believe we were almost the first* to call attention in England to the success that had attended the application of the *induced electric current* along the course of the vagus in the neck, in some cases of asthma. This mode of treatment had at that time been strongly advocated by Dr. Max Schäffer, of Bremen. The idea was that the source of irritation, in some cases, could be traced to swelling of the laryngeal, pharyngeal, or nasal mucous membrane, causing pressure in the neck on the vagus or other nerves in connection with the respiratory tract. The current must be of good strength, so that it can be felt as passing through the soft palate from one side of the throat to the other. It should be applied to the throat in the situation of the great nerve-trunks, the vagus and sympathetic, each pole being applied just below the angle of the jaw, and in front of the sterno-mastoid. Sir Peter Eade subsequently* reported the successful application of this method in a case of bronchitic asthma, with severe paroxysms of dyspnœa, which was under his care in the Norfolk and Norwich Hospital. The patient had been ill and under treatment for seven months before admission to the hospital. For more than two months he had been submitted in the hospital to various remedies, including chloral, iodide and bromide of potassium, lobelia, stramonium, ipecacuanha, opium, conium, carbolic acid, etc., without any satisfactory result, when it was determined to try the effect of the galvanic current in the manner we have described. "The patient was at once relieved, and was nearly cured in eleven days; whilst he was able to report himself as completely recovered in two or three weeks more."

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* *Lancet*, Nov. 13, 1880.

With regard to the **pneumatic treatment** of asthma, either by the portable apparatus or in the Pneumatic Chamber, it is clear that these methods are not applicable, or very rarely so, to the relief of the *severe* asthmatic paroxysms. These often occur suddenly, and at times and in places when it would be out of the question to apply treatment of this kind. Waldenburg, however, maintains that he has cut short the less violent paroxysms of asthma by the inspiration of compressed air.

But it is in the *intervals* between the attacks, and especially in the catarrhal form of asthma, that most may be expected from pneumatic treatment, in removing or lessening the emphysema, which invariably develops after a series of quickly recurring attacks, and in relieving the chronic catarrhal condition of the bronchial mucous membrane. Alternate inspiration of compressed air with expiration into rarefied air is therefore valuable in the intervals, leading to improvement in the emphysema and to a prolongation of the intervals between the paroxysms. In some cases it is useful to combine warm aqueous vapour, impregnated with ammonium chloride, with inspiration of compressed air.

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* *British Medical Journal*, Sept. 22, 1883.

Treatment in the *Pneumatic Chamber* is chiefly directed to producing an anti-catarrhal effect, and is, therefore, far more useful, as we have said, in the *catarrhal* than in the *nervous* form of asthma.

Inhalations of *oxygen* have been advocated for the relief of the asthmatic paroxysms; there can be no objection to trying this expedient, but we have not found it so useful in the severe paroxysms of nervous asthma as in the more continuous dyspnœa of the bronchial form; in these cases, and especially during the intervals of rapidly recurring attacks, it has seemed to be of much benefit and comfort to patients.

One of the most interesting and successful methods of treating asthma is that carried out at Mont Dore,* in Auvergne. We have described and discussed this method fully in our work on "Climate and Health Resorts."

Having reviewed most of the remedies that have been employed in the treatment of asthma, both during the paroxysm and in the intervals, we are now in a better position to consider its pathology.

After a careful consideration of all the arguments that have been adduced against the nervous theory of asthma, the more we see of cases of asthma, the more impossible it seems to us to resist the conviction that there is a nervous element in every case, and that in very many the nervous element is altogether the predominant one. Let us illustrate this remark by reference to a case of so-called "renal" asthma, not dependent on pulmonary œdema. Here we have blood contamination as an obvious cause of the nervous disturbance, and the chain of phenomena is tolerably complete. A patient, towards the closing scenes of Bright's disease, with contracted gouty kidney, and hypertrophied heart, and thickened arteries, gets sudden attacks of alarming dyspnœa, arising apparently without any cause, sometimes when sitting tranquilly by his fire-side after dinner, sometimes in the middle of the night, or at any other time. He has no cough, no moist *râles*, but expiration is difficult and prolonged, just as in the usual form of asthma; moreover, if you let him inhale chloroform vapour, the paroxysm of dyspnœa disappears. Now, it would seem that in such a case we have either a uræmic irritation of the respiratory centre setting up a sort of convulsion of the bronchial muscles, a sort of pulmonary epilepsy; or we may have a reflex excitement of the bronchial spasm in the following manner: an unusual proportion of the retained urinary excrement is being eliminated at the respiratory surface, and this irritates the peripheral terminations of the respiratory nerves, and so excites in a reflex manner contraction of the bronchial muscles. The urinous odour in the breath is always very marked in these cases.

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* The Mont Dore springs have been erroneously described as "Sulphurated Waters" (Wilson Fox's "Diseases of the Lungs," p. 76). They are really very weak, hot, alkaline waters, containing about 7 or 8 grains of bicarbonate of soda and 5 or 6 grains of chloride of sodium in the litre. There is also about $\frac{1}{70}$th of a grain of arseniate of soda in the same quantity, and for this reason they have been termed arsenical springs.

An explanation which holds good with regard to these renal cases of spasmodic asthma will hold good with regard to others in which the original disturbing cause is not so manifest. The nervous irritation may be central, or it may be peripheral. A certain inherited vulnerability or excitability (hyperæsthesia) of portions of the central or peripheral nervous system doubtless exists in certain persons. When it is the respiratory centre or the respiratory peripheral nerves which are thus affected, we encounter the phenomenon of spasmodic asthma, occurring from causes of irritation, sometimes so slight and evanescent as to entirely escape discovery.

But there is another possible view of the mode of action of the "nervous element" in asthma. I allude to the view put forward by Weber. He maintains that, "for many forms of asthma, the existence must be admitted of a tumefaction of the bronchial mucous membrane in consequence of dilatation of its blood-vessels through vaso-motor nervous influences." Those attacks of asthma which are observed to alternate with attacks of urticaria, and in some of which patches of swollen mucous membrane have been actually observed in the pharynx, would fall under this head. In commenting on this view, Riegel observes, "We may suppose that whenever an irritation affects the bronchial mucous membrane, this irritation may excite vascular turgescence in this region;—that the acute tumefaction of the mucous membrane of the bronchioles is the primary element in asthma may explain the milder attacks, but not the severe forms, here a second factor (muscular) must be associated; how otherwise shall we explain the frequently observed 'rapid amelioration after chloral hydrate, and like remedies?'" and he concludes that asthma is a "spasm of the bronchial muscles with simultaneous congestion of the bronchial mucous membrane."

But it must be admitted that the majority of cases of asthma are associated with, and often complications of, a pre-existing bronchial catarrh. But in these cases there is always a nervous element upon which the spasmodic paroxysmal nature of the attack depends. In the first place, the subjects of purely spasmodic asthma may, and do often, become simultaneously the subjects of bronchial catarrh. There is every reason why they should, possessing, as they do, a hyper-sensitive respiratory surface. But there yet remain a considerable number of cases in which the bronchial catarrh certainly appears to be the exciting cause of the asthma. Now such patients may be considered to suffer from hyperæsthesia of the bronchial membrane, just as others suffer from cutaneous hyperæsthesia, and in them the presence of tenacious, thick mucus in the finer air-passages acts as an irritant, and produces that amount of muscular spasm which is sufficient to give rise to a paroxysm of asthma. Thus it can be shown that in every case of asthma there is a nervous element; but in some cases the nervous state is the only one that needs to be dealt with therapeutically, while in others, where the bronchial irritation depends on the presence of a catarrhal state, the removal of this catarrhal condition must be the basis of any successful medication.

The many practical illustrations that must occur to every one who has seen much of asthma, of its neurotic character, seem to us overwhelming. We will allude to a few only; and first to the frequently observed alternation of attacks of asthma with other neurotic affections, as migraine, angina, hysteria, and certain cutaneous diseases. Dr. Cazalis, in his interesting *brochure*, "*Etude sur les Sueurs au Mont Dore*," mentions the case of a lady, 60 years of age, where there was alternation between attacks of asthma and urticaria and erysipelas. All the time the skin affection was present the chest was perfectly free.

It must have occurred to many how very rare it is to see a purely asthmatic paroxysm in the wards of a hospital; yet cardiac diseases and advanced emphysema and bronchial catarrhs are excessively common. If asthma were simply a catarrhal disorder, as some have maintained, its manifestation would be frequent instead of rare in our hospitals.

We have shown the remarkable influence of sedative and antispasmodic remedies in the relief of the asthmatic paroxysm. Numerous other considerations occur to us in support of the neurotic character of asthma; but they seem to be scarcely needed in order to establish a position already so strong. We should like, however, to point out one analogy with a well-known nervous and hysterical phenomenon which seems never to have been remarked upon. We allude to the great distension of the lung which is observed in many cases of asthma—a distension which has often been thought difficult of explanation; but may we not trace an analogy between this great distension of the lung in asthma and the very remarkable and hitherto unexplained tympanitic distension of the intestines often encountered in some cases of hysteria; a condition that will sometimes arise as suddenly as the asthmatic paroxysm, and which seems to be entirely neurotic in its origin?

But Professor Fraser's extremely valuable and interesting observations * on the influence of the *nitrites* on the dyspnœa of asthma and bronchitis seem to afford an experimental corroboration of the theory of *bronchial spasm* as the cause of the asthmatic paroxysm, and a refutation of the old catarrhal theory recently revived by Berkart, as well as of Weber's theory and its modification propounded by Sir Andrew Clark, that the cause of asthma is a vaso-motor disturbance affecting the vessels of the bronchial mucous membrane, and causing narrowing of the bronchial tubes by vascular intumescence of their lining membrane.

Berkart's contention is that asthma is essentially inflammatory, and is attended by changes in the epithelial lining of the bronchi, resulting in the formation of sero-fibrinous or fibrinous exudation, as proved by the *casts* expectorated (we have seen nothing that could be justly termed "casts" expectorated in ordinary cases of spasmodic asthma); the dyspnœic paroxysm is due to the displacement of plugs so formed, and their lodgment in other parts of the bronchial tract (but they should cause *more* dyspnœa *before* their detachment than *after*, as they would then more completely block the tubes in which they are supposed to be formed). This embolism causes mechanical obstruction to expiration, and may also set up true bronchial spasm. (If they were *detached*, however, the *expiratory* obstruction would be overcome, but it remains all through the asthmatic paroxysm.) The paroxysm subsides owing to the free excretion of thin fluid and the dilatation of the bronchi which allows of the escape of the impacted plugs; (but there is no *free excretion of thin fluid* when the paroxysm passes off under the influence of morphine or chloroform).* He suggests that a streptococcus which he has always found in the sputa may be the cause of the disease. He prescribes jaborandi or pilocarpine to loosen the impacted exudation.†

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* "The Dyspnœa of Asthma and Bronchitis: its Causation and the Influence of Nitrites upon It." By Thos. B. Fraser, M.D., F.R.S. Edinburgh: Oliver and Boyd. 1888.

With regard to the theory of vaso-motor hyperæmia, Professor Fraser remarks, "A very different treatment would be suggested for the cure of a dyspnœa dependent on stenosis of the bronchial tubes caused by hyperæmia, from the treatment of a dyspnœa dependent on stenosis caused by spasm of the bronchial muscles."

In applying the use of the nitrites during the asthmatic paroxysm to the elucidation of this question, Prof. Fraser was guided by the now well-ascertained fact that these bodies rapidly produce great dilatation of the blood-vessels by their special influence over smooth muscular fibre. The stenosis of the bronchial tubes associated with the asthmatic paroxysm is attended by certain easily observed auscultatory phenomena, viz. dry *râles* of a cooing, whistling, and snoring character; if the stenosis is due to spasm of the involuntary muscular fibres in the bronchial tubes, the administration of a substance which is known to have a special power of causing relaxation of their muscles ought to be found to remove the stenosis, and with the removal of the stenosis, the auscultatory phenomena observed during its existence should disappear. But if the stenosis is due to fluxionary hyperæmia of the bronchial mucous membrane, then, as these substances are known to rapidly cause great dilatation of the vessels, their administration ought to be attended by an aggravation of the stenosis and an intensification of the dyspnœa, as well as of the auscultatory phenomena dependent on the stenosis.

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* We have a patient now under our observation who has suffered for five years from attacks of asthma without ever having had any cough or expectoration, until a few weeks ago, when on exposure to chill she acquired a severe bronchial catarrh, which has naturally greatly aggravated the dyspnœic attacks.

† Leyden found sharp-pointed octohedral crystals in the sputum of asthmatics, and based on that observation a method of treatment which is no longer seriously thought of. Similar crystals have been found in sputum other than that of asthmatics.

In the first case of spasmodic asthma in which the effect of inhaling 10 minims of nitrite of amyl was tested, it was found that in two minutes the cooing, whistling, and creaking *râles* had entirely disappeared, the sense of tightness in the chest was gone, and the breathing was easier. The transient nature of the influence of the nitrite was shown by the return of all the auscultatory and general phenomena of the attack after a few minutes. On re-administration of the nitrite these phenomena again disappeared almost immediately, and returned again, however, very quickly; and the same occurred a third time.

In another case the nitrite of amyl was given by the mouth, 5 minims in 2 drams of water, with the view of obtaining *more lasting* results; nitrite of ethyl (nitrous ether), 10 minims of a 25 per cent. alcoholic solution mixed with 2 drams of water; nitrite of sodium, 10 minims of a 10 per cent. solution mixed with a dram of water; and nitro-glycerine, 2½ minims of a 1 per cent. solution with 1½ dram of water, were also given during different attacks to the same patient. The effects were similar, but *far more* lasting, except with the nitro-glycerine, the beneficial influence of which was almost instantaneous, but its duration briefer.

In another patient 5 grains of nitrite of sodium dissolved in a dram of water caused the auscultatory signs and the dyspnœa to disappear in a few minutes. Generally the dyspnœa could be relieved by 1- or 2-grain doses. On one occasion a dose of 5 grains was followed by toxic symptoms, great cardiac feebleness, which was relieved by brandy.

"The administration by the stomach of nitrite of amyl, nitrite of ethyl, nitrite of sodium, and nitroglycerine therefore produced the same kind of effect on asthma as that which followed the administration by inhalation of the volatile of these nitrites. A marked and, for therapeutic purposes, a very important difference, was manifested in the duration of these effects, which were greatly prolonged by stomach administration."

"The observations," says Professor Fraser, "that have been described show that both the dyspnœa and the sounds in the chest can be made to disappear simultaneously, or nearly so, by substances whose action is to reduce, powerfully, the contractility of non-striped muscle. It appears to follow from this that the dyspnœa of asthma is caused by spasm of the bronchial muscles;" and Professor Fraser has thus established on an experimental foundation the essentially spasmodic nature of the asthmatic paroxysm.

He also caused an examination to be made of the various fumigating papers and powders sold for the relief of asthma, in order to ascertain if, after burning, their smoke contained nitrites; it was found "abundantly" in Himrod's, and in Huggins's and Fruneau's papers; and "distinctly" in four others.

Professor Fraser concludes that the administration of the nitrites "in asthmatic dyspnœa or orthopnœa is entitled to rank as one of the most valuable of the applications of pharmacology to the treatment of disease."

We have now reviewed most of the remedial measures proposed for the treatment of asthma, both during the paroxysm and in the intervals; it will be found that, numerous as these remedies are, one cannot have too many resources in dealing with so capricious a disease as this is, and that remedies that will be most efficient with one individual will fail with another, or will be unable to be persevered with on account of some disagreeable collateral effects. If we had to select a limited number of these remedies to which we were to be restricted we should choose the following: *Morphine* with *atropine; chloroform;* the *nitrites; fumigations* with *nitre* and *stramonium; stramonium; caffeine; iodide of potassium,* and *arsenic.* Cases associated with chronic bronchial catarrh and emphysema will, of course, not be cured so long as the bronchial catarrh remains uncured, and our remedies must be directed to curing the catarrhal condition according to the principles laid down in the last chapter. All physicians are agreed as to the utility of free action of the bowels in warding off a threatened attack. A dose of calomel will, in this way, often be of service. Large doses of alcohol have been commended by some, but we should hesitate about prescribing these, as we think there is some danger of establishing an alcoholic habit, and this would certainly favour pulmonary degeneration and emphysema.

We have still a few remarks to make on the subject of the climatic, dietetic, and hygienic management generally of the asthmatic.

As to the **climatic** and atmospheric conditions which are favourable to the cure of asthma, it has generally been taught that patients should be removed to a place which presents the precisely opposite conditions to those which prevail in the locality where the asthma has attacked them, and it has been especially insisted upon that the densely populated, smoky, and stuffy districts of large cities are the most suitable for the relief or prevention of spasmodic asthma. Unquestionably, many cases have been observed by competent observers, in which disappearance of the asthmatic paroxysms had attended the removal of the patient to crowded cities; and it is, perhaps, rather a curious circumstance, how few sufferers from spasmodic asthma are found amongst the population of the poorest districts of London.

But we are disposed to think that too much has been made of this, and our own experience would point to more numerous instances of the cure of asthma by removal to what might be called *anti-catarrhal* districts; and if it is true, as has been stated, that 80 per cent. of all cases of asthma are complicated with bronchial catarrh, this result might be anticipated. It is the purely nervous cases that are so capricious with regard to climate and atmospheric conditions; and this capriciousness will be observable even in the case of seaside resorts in close proximity to one another. We have known a patient leave London on account of asthma for Deal, and on reaching this place find his asthma worse than in London, but on moving a few miles along the same coast to Folkestone his asthma left him immediately. Nervous cases, or cases in which there is a strong nervous element, especially in young people, will often do well in high altitudes, as in the Engadine, and a few catarrhal cases also, in the young and vigorous, will do well in such localities if they encounter a fine season, but in bad seasons they are sometimes injuriously affected. Cases complicated with chronic bronchial catarrh and emphysema should never be sent to these resorts. The late Dr. Ludwig, of Pontresina, shortly before his greatly regretted demise, wrote to us an account of the case of a gentleman who had been sent from England in this state to the Engadine. He was seized on crossing the Albula Pass with the most fearful dyspnœa, which remained unrelieved until he could be sent down over the Maloja Pass to Italy.

Cases in which bronchial catarrh has been the exciting cause of asthma will, some of them, recover completely at Madeira. They leave England feeble invalids, and we have seen them return robust and well. It is as well, however, when they are in a position to do so, that they should return to Madeira for a few months, for three or four successive winters, —from December to May. The Canaries offer an alternative resort. At Arcachon, Biarritz, Pau, and at Amélie les Bains we have found asthmatic patients do well in winter. We have known some very bad cases who have avoided returning to England by passing their winters at Pau and their summers at Bagnères de Bigorre. The Riviera resorts cannot be relied on in asthmatic cases, but some asthmatic patients have done remarkably well at Grasse. Some of the emphysematous and catarrhal asthmatics obtain advantage in the summer from moderate elevations like Montreux or Glion, Lugano, Aussee, Reichenhall, and Meran; in the last two places they can have the advantage of well-arranged pneumatic treatment.

In England we have known the climate of Folkestone and Eastbourne, in the summer, to be very useful to some cases, and that of Bournemouth and Hastings in the winter. The pine district around Woking, Weybridge, and Ascot has also been of service in numerous instances.

Bronchitic cases should be warmly clad, should avoid all causes of catarrh, and should live in well-warmed, suitably ventilated apartments, and should not be made to sleep in *cold* bedrooms. It is worth noting that the asthmatic paroxysm often occurs during the coldest part of the night, viz. between 2 and 4 a.m. We know many sensitive persons who at once wake up in the night if there is a fall of temperature, and it is quite conceivable that, if an asthmatic woke up in such circumstances, he would wake up with an attack of asthma. Suitable *gymnastic exercises* have been found useful in keeping off attacks in children. Exercise in the open air (*not fatiguing* exercise), and cold sponging, when it can be borne, followed by friction with a rough towel, are good hygienic measures for removing undue sensitiveness of the surface.

As asthmatic paroxysms are often induced by digestive disturbances, it is of the highest importance to see to the proper regulation of the diet and meals of an asthmatic patient, in the intervals between the attacks. All indigestible articles of food should be avoided, but especially those which he has learnt by experience are prone to induce a paroxysm. Suppers and late dinners are to be forbidden, and the principal meal should be taken in the middle of the day.

The adoption of a vegetarian dietary has been found of value in some cases.

Tendencies to constipation and flatulence should be guarded against by some suitable aperient. An aloes and ipecacuanha pill after dinner is the best in many cases; and an occasional dose of Carlsbad salts may be added. Any disorder of the female sexual organs must, of course, be remedied.

All depressing emotion should be avoided; but pleasurable ones sometimes have the effect of dissipating the attack.

PULMONARY EMPHYSEMA.

We are unable here to enter upon the consideration of the many interesting questions that are concerned in the discussion of the pathology and etiology of pulmonary emphysema, and we can only refer, very briefly, to those points which have an essential bearing on the indications for treatment.

Pulmonary emphysema was correctly and briefly defined by Laennec as "an excessive, permanent, and abnormal distension of the air-cells." This, of course, applies to "*vesicular*" emphysema, for "*interlobular*" emphysema—*i.e.* the passage of air into the connective tissue between the lobules of the lung—does not here concern us, as it is a condition practically removed from effective treatment. We may generalise the **causes** of vesicular emphysema by saying that it is either due to excessive strain on the interior of the *normal* air-cells, whereby they lose more or less of their elasticity and become dilated, as in violent inspiratory and expiratory efforts, and especially the latter; or it is determined by degenerative and atrophic changes in the walls of the air-cells themselves, by which they lose their normal resisting power; or the two conditions may, to some extent, be co-operative.

We encounter pulmonary emphysema in various degrees; sometimes very slightly developed and sometimes in a very advanced stage; sometimes partial—*i.e.* affecting only certain portions of one or both lungs—and sometimes general. The partial forms are often what is termed "compensatory"—*i.e.* a dilatation of certain groups of air-cells to take the place of others that are collapsed or for some cause or other rendered ineffective. These "compensatory" forms are often rather conservative than injurious, and partake of the nature of compensatory hypertrophy, and do not therefore concern us here.

One of the chief **indications** in the **treatment** of this disease is to prevent slight cases becoming severe ones by withdrawing the patient from the influence of those conditions which produce it. The early stages of emphysematous dilatation of the air-cells very commonly arise from the strain of athletic exercises during the period of growth and development, especially in comparatively feeble organisations. On examining the chests of youths who have submitted themselves to strain of this kind, it will be found that the inspiratory expansion is very limited, the excursion of the chest in passing from the forced expiratory to the forced inspiratory position often not exceeding an inch or an inch and a quarter. This is often overlooked, and the subjects of it are not cautioned, as they should be, against pursuing "*sports*" or *exercises* for which they are unsuited, and which lead in course of time to both pulmonary and cardiac strain.

As this disease very frequently originates in and becomes aggravated by repeated attacks of bronchial catarrh and the paroxysms of coughing which accompany them, the prophylactic indication points also to the removal of such patients from the predisposing and exciting causes of such attacks. Emphysema frequently has its origin in severe and protracted attacks of whooping cough in early life, a disease which we shall hope to show is much more amenable to rational treatment than is sufficiently recognised.

Asthma is a disease which usually, in course of time, leads to the production of emphysema of a severe form. When emphysema is a complication of *asthma*, or is associated, as it so constantly is, with chronic bronchial catarrh, the indications for treatment, both prophylactic and remedial, must be sought to a great extent in what we have said of the management of those diseases, which we need not now repeat.

The avoidance of all physical *strain*, and the strict limitation of physical exercises to such as are gentle and in no degree excessive, and the protection of the patient from all causes of catarrhal attacks, are the chief indications in the treatment of emphysema, and for preventing the slighter degrees from advancing into the more serious forms.

There is little in the way of remedial measures that can be directly applied to the dilated and atrophied lung tissue, to the restoration of the lost elasticity of the air-cells, or to the restoration of the obliterated capillaries in their walls. Arsenic and iodide of potassium have both been credited with the power of retarding degenerative changes, and both are of use in the treatment of catarrhal and dyspnœic states, as we have already shown. When emphysema is associated with an acute catarrhal condition of the air-passages, whatever can free the air-passages from the secretions obstructing them by promoting expectoration will, of course, be beneficial. For this purpose saline, alkaline, and ipecacuanha sprays have been applied and found useful.

Free evacuation of the bowels, and measures to relieve any flatulent distension are very needful in cases of emphysema to take off from the diaphragm any pressure from below, and to allow it to descend as freely as possible. With this view also the food should be concentrated, nourishing, and not bulky.

If we apply ourselves to dealing with the emphysematous condition of the lungs apart from co-existing catarrhal states, our chief resource must be those tonic and hygienic measures that are calculated to improve the general nutrition—air, climate, food, exercise, and tonic medicines, such as iron, arsenic, strychnine, cod-liver oil — selected and adapted to individual cases and on general principles. We must remember that we have, in all advanced cases, a state of dilatation of the right side of the heart to deal with, which will also be benefited by this *general* tonic treatment.

Attempts have been made to remedy the pulmonary condition, and to improve the respiratory functions in emphysematous cases, either by causing them to breathe compressed air in the Pneumatic Chamber, or by means of a portable apparatus * to inspire compressed air and expire into rarefied air. No doubt great relief to the dyspnœa such patients suffer from is often experienced from expiration into rarefied air. The suction action exerted on the air in the lungs leads to more complete pulmonary ventilation, to the removal of stagnant air in the air-cells, and to the free entrance of fresh air. The physical signs also often show a marked improvement in the condition of the lungs. † When there is co-existing bronchial catarrh it is necessary to precede the expiration into rarefied air by inspiration of compressed air, else irritative cough is excited.

Treatment in the compressed-air chamber has also been attended with good results, in not too advanced cases, and it is especially applicable to cases complicated with chronic bronchial catarrh, which it relieves. At Reichenhall inhalation of the saline spray is combined with treatment in the Pneumatic Chamber. How this method acts has been the subject of much discussion; it probably increases the flow of blood through the lung, and so improves its nutrition.*

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* The various forms of apparatus devised and used for this purpose will be found fully described in the author's translation of Oertel's "Respiratory Therapeutics." (Smith, Elder, and Co.)

† *Ibid.*, p. 541.

ADDITIONAL FORMULÆ.

For the non-paroxysmal dyspnœa of asthmatics.

℞ Chloral hydrate, 2 drams.
Ammonii chloridi, 75 grains.
Morphinæ hydrochlor., 1½ gr.
Antimonii tartarati, 1 grain.
Grindeliæ robust. fluid. extr., 6 drams.
Syrup. glycyrrhizæ, 1 oz.
Aquæ ad 3 oz.

M. f. mist. A teaspoonful in water every three to six hours. (*N. S. Davis.*)

Or

℞ Chlorali, 5 drams.
Sodii nitritis, 45 grains.
Tinct. stramonii, 2½ drs.
Syrupi simpl. ad 3 oz.

M. f. mist. A teaspoonful in water every four hours. (*N. S. Davis.*)

Anti-asthmatic mixture.

℞ Potassii iodidi, 2 drams.
Liq. Fowleri, 1 dram.
Vini ipecac., 4 drams.
Tinct. hyoscyami, 4 drams.
Aquæ chlorof. ad 8 oz.

M. f. mist. A tablespoonful three times a day in water after food. (*Whitla.*)

Mixture in bronchial asthma.

℞ Extr. quebracho, 1 dram.
Morphinæ hydrochlor., ½ gr.
Syrupi simpl., 5 drams.
Aquæ mellissæ ad 4 oz.

M. f. mist. A tablespoonful every two or three hours. (*Bamberger.*)

Another.

℞ Chloral hydrate, 20 grains.
Potassii iodidi, 20 grains.
Syrupi simpl., ½ oz.
Aquæ ad 4 oz.

M. f. mist. A fourth part every two to four hours. (*Schnitzler.*)

Lobelia mixture for the asthmatic paroxysm.

℞ Tinct. lobeliæ, 1 oz.
Ammonii iodidi, 2 drams.
Ammonii bromidi, 3 drams.
Syrupi tolutanæ, 2 oz.

M. f. mist. A teaspoonful every one, two, three, or four hours. (*Bartholow.*)

Mixture for asthma.

℞ Tinct. lobeliæ, 6 drams.
Potassii iodidi, 2 drams.
Tinct. camphoræ comp., 6 drams.
Dec. senegæ ad 6 oz.

M. f. mist. A tablespoonful for a dose. (*Green.*)

Another.

℞ Extr. grindeliæ fluid., 2 drs.
Extr. lobeliæ fluid., 1 dram.
Extr. belladonnæ fluid., ½ dr.
Potassii iodidi, 1½ dram.
Glycerini, 1½ oz.

M. f. mist. A teaspoonful for a dose. (*Bartholow.*)

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* *See* Oertel's "Respiratory Therapeutics," p. 693, for a full discussion of this question.

Pills for nervous asthma.

℞ Sodii iodidi, 1½ dram.
Pulv. et extr. glycyrrhizæ, 1 dram.

M. et divide in pil. 60. Five to eight to be taken twice a day. (*Benedikt.*)

Powder for fumigation.

℞ Stramonium leaves, 4 drams.
Green tea, 4 drams.
Lobelia, 1½ dram.

Mix and pour on the mixture enough saturated solution of nitre to wet it. Dry it and preserve in a closely stoppered bottle. (*Plant.*)

Another.

℞ Stramonium leaves, coarsely powdered, 2 oz.
Anise fruit, powdered, 1 oz.
Nitre, powdered, 1 oz.

Mix. A little of this to be placed on a plate and ignited. *Sawyer.*)

Another.

℞ Datura tatula, 2 drams.
Stramonium leaves, 2 drams.
Cannabis indica, 2 drams.
Powdered nitre, 2 oz.
Ol. of eucalyptus, ½ dram.

Mix thoroughly. Put a teaspoonful on white paper in a saucer, and burn in bedroom.

(*This powder is very warmly recommended by Dr. Woodward of Worcester.*)

Another.

℞ Stramonium leaves, 1 oz.
Lobelia, ½ oz.
Belladonna, ½ oz.
(Grind thoroughly in a mill.)
Nitre powdered, ½ oz.
Laudanum, ½ oz.

Dissolve the nitre in the smallest possible quantity of hot water, and add the laudanum ; with this thoroughly saturate the minced and ground leaves, and dry at a gentle heat. When dry, mix well with powdered camphor and keep in a stoppered bottle. (*S.B.*)

CHAPTER V.

THE TREATMENT OF PNEUMONIAS.

I. ACUTE LOBAR PNEUMONIA.—Symptoms, Physical Signs, and Anatomical Lesions—Etiology—Pneumonia a Specific Infective Fever—Influence of Chill—Climatic and Atmospheric Influences—Predisposing Causes—Evidence in Favour of its Specific Microbic Origin—*Indications for Treatment*—General Considerations deducible from the Natural History of the Disease—Quinine—Mode of employing It—Formulæ—Temperature Charts—Aconite—Jurgensen's Estimate of Quinine—Antiseptic Agents—Pneumotoxin and Antipneumotoxin—*Treatment of Symptoms*—Pyrexia and Hyperpyrexia—Cold Baths—Varying Opinions—Local Applications of Cold—Ice-bags—Veratria—Digitalis—Antipyrin—Phenacetin—Sodium Salicylate—Pain—Leeches, etc., etc.—Chloroform Inhalations—Dyspnœa—Blood-letting—Strychnine in Hypodermic Injections—Oxygen Inhalations—Ether and Morphine in Nervous Forms—Loomis on Opium—Delirium—Sleeplessness—Cough—Gastric Catarrh—Diarrhœa—*Treatment of the Tendency to Cardiac Failure*—Food—Alcoholic Stimulants—Hypodermic Injections of Ether and Caffeine—Disinfection—*Treatment of Convalescence.*

II. CATARRHAL, LOBULAR, or BRONCHO-PNEUMONIA.—Mode of Origin—Course—Anatomical Lesions—Symptoms and Physical Signs. *Indications for Treatment*—Emetics—Sprays—Saline Drinks—Treatment of Symptoms—Cough—Pyrexia—Gastro-intestinal Symptoms—Nervous Symptoms—Respiratory Failure—Stimulants—Food—Convalescence.

III. SECONDARY PNEUMONIAS.—Gangrene of Lung. Additional Formulæ.

IN dealing with the important subject of the **treatment** of **pneumonias** our task will be facilitated by dividing them into three classes: (1) Cases of *acute lobar pneumonia*, the "*croupous*" pneumonia of German writers; (2) cases of *catarrhal, lobular*, or *broncho-pneumonia;* and (3) cases of *secondary pneumonia*—*i.e.* pneumonia supervening in the course of other diseases.

We shall first deal with the subject of **acute lobar pneumonia,** characterised by the following symptoms, physical signs, and anatomical lesions.

The attack usually begins suddenly with a well-marked *rigor.* The temperature rises rapidly, and may reach 104° in a few hours from the initial rigor. The skin feels to the touch peculiarly hot and dry; after the chill, a bright *red flush* is noticed on one or both cheeks, especially over the malar regions, the eyes are glistening, the expression anxious, the nostrils working, and there is often a patch of herpes on the lips. There are the usual symptoms of fever—loss of appetite, thirst, furred tongue, headache, aching of the limbs, general malaise, scanty, high-coloured urine. The pulse is quickened, as are the respirations, and it has been noted that, in most cases, the pulse and respiration ratio is disturbed; but this is not so uniformly the case as some authors maintain. The respirations may be accelerated to thirty, forty, up to sixty in the minute, while the pulse-rate may range between 100 and 130; but it is not uncommon to find a much higher pulse-rate during some part of the course of the disease.

Besides these *general* symptoms, there are others complained of, referrible to the local lesion. These may not appear until twelve or twenty-four hours after the appearance of the general symptoms. *Pain* in the side is one of these, and is dependent on the existence of *pleuritis* over the portion of inflamed lung. It is sometimes extremely severe (in a few cases it is absent), and as it is aggravated by the respiratory movements, the patient endeavours to check these, and so increases the shallowness and, therefore, the rapidity of the respirations. *Cough* is another symptom, which is restrained by the patient as much as possible on account of the pain in the side that attends it. The cough is accompanied by *expectoration*, which is brought up with difficulty, as it is scanty, and extremely tenacious and viscid. It usually contains blood mixed with it, altered in colour, so as to give to the sputum a "rusty" hue, or it may be bright red or of paler tint. (Cough and expectoration are sometimes absent in children.)

When the disease runs the usual average course it is common for the fever to terminate by "crisis," generally between the fifth and eighth days, sometimes a day or two earlier or later. The temperature falls rapidly, and in from six to twenty-four hours may reach or descend below the normal. From this moment the convalescence is often rapid.

Associated with these symptoms the following *physical signs* may usually be found on examination of the chest. Usually over the base of one lung (the right most frequently), sometimes over the upper lobe, some *loss of resonance*, increasing as the disease advances to complete *dulness* on percussion, is found; over this area of dulness fine *crepitations* can usually be heard, with the inspiration, at the onset of the attack. When the lung, however, becomes *solid* from exudation into the air-cells, this sound disappears. Friction sounds are also frequently detected over the inflamed lung from involvement of the pleura in the inflammation. *Tubular*, *bronchial* breathing, and *bronchophony* are also usually to be heard over the affected portion of lung; there is also, commonly, *increased vocal fremitus* in this situation.

These physical signs and the *pulmonary* symptoms depend upon the presence, first, of acute hyperæmic engorgement of the lung; and, secondly, of exudation into the air-cells, this exudation consisting chiefly of fibrin mixed with red and white blood corpuscles and epithelial cells.

No one has ever seen the appearances presented by a *living* lung in pneumonia, and such descriptions as are given in text-books of the different stages of pneumonia are, it must be remembered, merely descriptions of post-mortem appearances.

It is common to speak of three stages:—First, a *stage* of *engorgement*, or vascular dilatation and distension; secondly, a stage of *red hepatisation*, when the air-cells are filled with a solid exudation; and thirdly, a stage of *grey hepatisation*, when the exudation into the air-cells is undergoing degenerative changes, but this change in colour may be only a *post-mortem* appearance. As we are only concerned now with the natural, clinical history, and course of pneumonia, enough has been said to *characterise* the form which we are at present concerned with. As recovery proceeds the exudation into the air-cells melts down, and disappears, some of it being expectorated, but most of it being absorbed. The pulmonary tissue again becomes permeable to air, the physical signs disappear, and the normal condition of the lung seems to be completely restored.

The *symptoms* we have mentioned as attending the course of acute pneumonia, assume, in some cases, an aggravated character, and are accompanied sometimes by others even more serious still. We shall have to consider these fully: the *pain* in the side may be intense and almost unbearable; the *cough* may be so frequent as to threaten to exhaust the patient; the *pyrexia* may be so great as to demand active interference for its reduction; the *dyspnœa* may be extreme, and life may be threatened either from the extent of the inflammatory exudation, or from collateral pulmonary engorgement, or from cardiac distension and enfeeblement. *Sleeplessness and delirium* are both serious and distressing symptoms which are often present, and require careful attention. The most serious condition of all is the tendency to *cardiac failure*, the danger of which in severe cases should never be lost sight of.

We have yet to pass in review the question of **etiology** before we can satisfactorily set forth rational indications for the treatment of this disease.

The opinion that this form of pneumonia is not merely a local disease, with symptomatic pyrexia, as was formerly believed, is now almost universally adopted, and primary, acute, lobar pneumonia is regarded as an acute specific general disease, a *specific infective fever*, caused by a *specific poison*, an *infective microbe*. The lung affection is simply the characteristic local lesion, just as the intestinal ulceration is the characteristic lesion of typhoid fever.

It is not necessary here to enumerate the numerous facts which might be cited to show that the constitutional disturbance does not depend upon, nor is it proportionate to, the local lesion.*

The idea formerly so prevalent that pneumonia was generally caused by **chill** has been shown to be erroneous, for careful investigation has proved that but a small percentage of cases of acute lobar pneumonia can be traced to chill. Still, in a certain proportion of cases, chill from exposure to cold seems to be a contributing cause. This is not inconsistent, as we shall see, with the view that its exciting cause is a specific organism. With regard to *climatic* and *atmospheric* influences, all that can be positively asserted is that the prevalence of pneumonia is not determined by *cold* alone, but that the presence of great vicissitudes of temperature, and especially exposure to cold winds from the north-east, seem to be related causally with its periods of greatest prevalence. In Great Britain it is most prevalent in April and May—a period when there is much exposure to easterly winds, rapid and great variations of temperature, and at times high degrees of atmospheric moisture.

It is notorious that the state of the general health is *lowered* during the prevalence of these atmospheric conditions, and the constitution is less capable of resisting the invasion of infective germs. And, as we have pointed out elsewhere, "winds are carriers of dust as well as abstracters of heat; and while, on the one hand, they carry away heat from the surface of the body, on the other hand they gather up dust of all kinds, and blow all manner of micro-organisms into our air-passages. Any depressing agency may predispose to pneumonia, such as exhaustion from physical fatigue, and depressing emotions; and it may be that exposure to a cold wind acts both as a predisposing cause, by the depression of the normal resisting power it produces by rapid abstraction of heat, and also as an exciting cause, by means of the micro-organisms it blows into our air-passages; especially if the view already suggested be correct, *that a paralytic or sub-paralytic condition of the bronchial ciliated epithelium* may in this way be induced," so that its influence in preventing the passage of infective germs into the finer air-passages and air-cells may thus be lost.

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* The usual arguments advanced in support of this view are these:—That in well-marked cases the fever does not run parallel with the physical signs of pulmonary inflammation. It frequently precedes them by a considerable interval. It does not coincide with them in degree or duration. *High* fever often accompanies a *small* tract of inflammation when it is situated at the apex of a lung instead of at the base. The fever often suddenly subsides long before the local signs show a corresponding improvement in the lung. Moreover, it resembles the *specific fevers* in its typical course—the rapid onset, the sudden defervescence. Finally, the anatomical changes in the lung are not such as can be produced by artificial injury of that organ.

Debilitating conditions, early childhood, and advanced age, in association with unfavourable atmospheric influences are, therefore, predisposing causes. There also would appear to be an individual predisposition to this disease, some persons having suffered from a number of attacks.

The evidence in favour of the origin of acute pneumonia from a **specific germ** is exceedingly strong: *e.g.* (1) its known occurrence as widely spread or localised epidemics; (2) the frequent coincidence of *local* outbreaks with an insanitary state of the locality, groups of cases being distinctly traceable to exposure to *sewer gas* ("pythogenic cases;")* (3) its occasional observed spread by *infection*; (4) the discovery of germs ("diplococci" or "pneumococci"), analogous to those of other infective diseases, in the tissues, their cultivation, and the production of pneumonia by their injection into certain animals.†

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* "These 'pythogenic' pneumonias are distinguished by a marked degree of adynamic delirium, bloody sputa, and by a tendency to rapid death. . . . They have, however, a tendency to terminate by crisis, which is marked in some cases." (Wilson Fox, "Diseases of the Lungs," p. 267.)

† The author accumulated many facts and illustrations in

Having referred thus briefly to the clinical characters and the etiology of acute lobar pneumonia, we may now proceed to the consideration of the **indications** for its **treatment.**

1. The first indication springs out of etiological considerations, viz. *to endeavour, if possible, to antagonise the injurious influences of the specific infective organism on the blood and the tissues.*

2. The second indication is obvious, viz. *to relieve and to endeavour to subdue dangerous or distressing symptoms.*

3. The third indication is also obvious, viz. *to support the patient's strength, and to endeavour to remove or moderate all conditions tending to exhaustion.*

We believe these three indications will cover the whole ground of the rational treatment of pneumonia.

Although possessing a certain historical interest, it would be a waste of time to examine here the various routine methods of treatment of pneumonia, formerly pursued, and now abandoned—such as repeated blood-letting, large and repeated doses of tartar emetic, calomel, and other so-called *antiphlogistic* measures. Nor shall we occupy valuable space by extended references to statistics. The fallacies underlying this method are especially evident in their application to the treatment of such a disease as pneumonia, as it takes no account of an infinite variety of modifying conditions that affect results, apart from the particular point this method may be called in to investigate.

Skoda and Dietl, in 1847, may be regarded as, to some extent, the founders of the modern treatment of pneumonia, for they showed that whereas, when cases of pneumonia were practically left to themselves, or treated on the so-called "*expectant*" method, the mortality was rather less than 8 per cent.; when treated either by *blood-letting* or by *tartar emetic* the mortality was nearly 21 per cent.

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support of this view in an "Address on Pneumonia," delivered at Birmingham in 1884, and published in the *Birmingham Medical Review.*

Basing their observations on the relative success of the **expectant** method, and on a consideration of the natural history of cases of pneumonia, it has been maintained that the attempt to draw any conclusions as to the efficacy of any particular medicinal interference in the treatment of this disease is so beset with possible fallacies as to be useless; for, since pneumonia is so prone, when left to run its natural course, to terminate suddenly and rapidly in complete recovery, therefore it is quite unjustifiable, however good the results that follow any line of medicinal treatment may be, to maintain that they are *due* to that treatment, and not merely the natural issue of a series of remarkably benignant examples of the malady. This, it seems to us, is to assert *too much*. Surely a practitioner of experience and judgment, of acute observation and quick perception, acquires the faculty of distinguishing a *prolonged series of consequences* from a *prolonged series of mere coincidences.*

To deny such powers of discrimination to others, or to pretend to reserve them to ourselves, is both unjust and egotistic. If such a practitioner sees that he obtains, in a uniform manner, better results with a particular method of treatment than with other methods of treatment, he may surely trust the observation of his own senses and conclude that it has had something to do with the better results obtained. And it must be remembered that the careful and guarded impressions of such an observer are worth far more than the evidence of blindly and mechanically compiled statistics, accumulated by a variety of persons, with very variable faculties for accurate observation and just inference.

We have, ourselves, been led in this way to the conclusion that **quinine** frequently exercises a beneficial influence over the course of acute pneumonias of the class we are considering. And this belief has impressed itself on a considerable number of other observers. We do not, however, look upon this drug merely as a depressor of temperature, as some appear to do, but we regard this effect as incidental to some direct action on the infective morbid agent, or on its activities. We have been led to conclude, from facts observed, that quinine has an antagonistic effect upon the injurious activities of many infective germs, in what precise manner it is impossible at present to say. To call this effect "*germicidal*" is unjustifiable, because it may possible act in some way quite unconnected with the death of the germs.

We have not given quinine in the *large* doses advised by Jurgensen and others; but we have always given it in a special manner, which we believe greatly influences its favourable action. We give from 1 to 3 grains every two to four hours, according to the age of the patient, and the apparent severity of the attack, and we give it dissolved in citric acid, and then added to an alkaline mixture, so that it is really taken in an effervescing saline draught.

The following is the formula we usually prescribe:

℞ Quininæ sulphatis	1 to 3 grains.
Acidi citrici	10 to 15 ,,
Sacchari[*] lactis	10 ,,

M. f. pulv.

This powder is dissolved in a little water and added to the following draught:

℞ Potassii bicarb.	10 to 15 grains.
Ammonii carb.	3 to 5 ,,
Syrupi aurantii	1 dram.
Aquæ	ad 1 oz.

M. f. haust. This dose is given every two, three, or four hours, according to the age and severity of the case.

We append copies of the charts showing the course of the pyrexia in three consecutive and typical cases thus treated (Fig. 18). They were cases of quite

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[*] The sugar is necessary to prevent the acid and the quinine from caking together, and sticking to the paper.

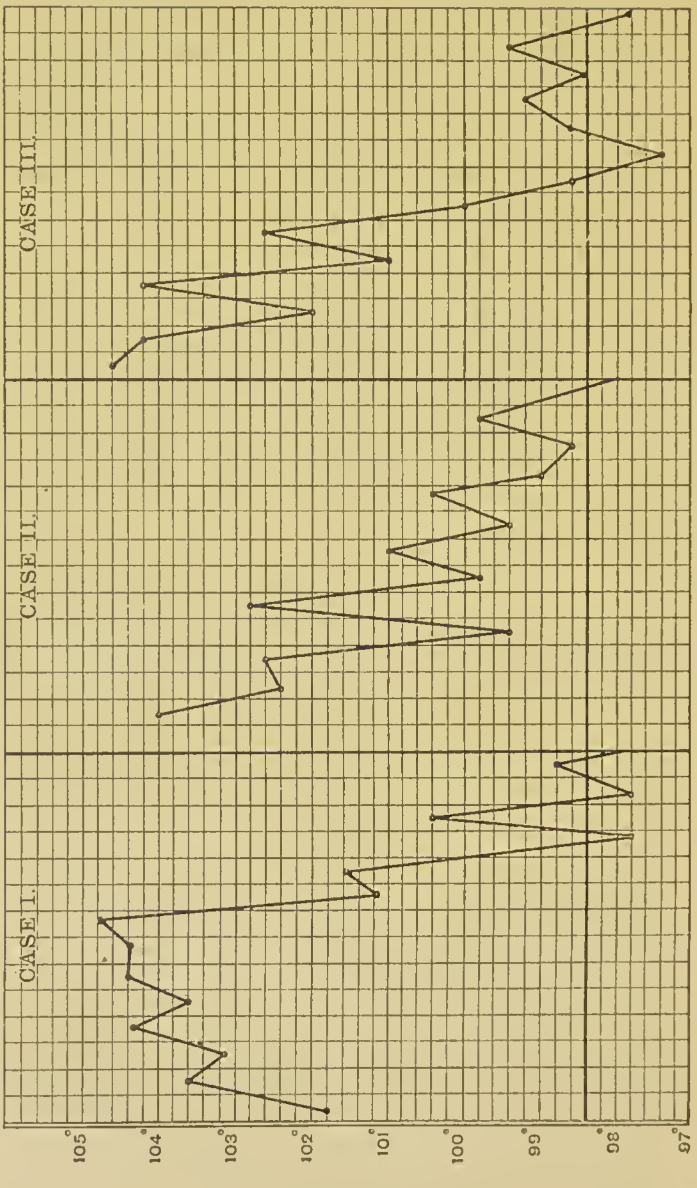

Fig. 18.—Chart of cases of Acute Lobar Pneumonia.

average severity. One (case 2) was an alcoholic case, and one (case 3) was a boy with pneumonic consolidation of the *whole* of the right lung.

Case 1.—Male, aged 40. *Pneumonia,* lower lobe right lung, with pleuritic friction; had chronic bronchial catarrh before the attack. Systolic murmur at cardiac apex. Highest respiration-rate, 55; highest pulse-rate, 160. Tongue brown, dry, and tremulous. *Stimulant,* 6 to 8 oz. of brandy in twenty-four hours. Convalescence uninterrupted.

Case 2.—Male, aged 32; alcoholic. *Pneumonia* of right lower lobe and pleuritic friction, complicated with *delirium tremens* (not violent). Highest respiration-rate, 30. Highest pulse-rate, 126. Tongue very dry and brown. *Convalescence* rapid and uninterrupted.

Case 3.—A boy, aged 7. *Pneumonia* of *whole* of right lung; dulness absolute from base to apex, back and front. Pleuritic frictions at base. Œdematous crepitation at extreme base of *left* lung. Highest respiration-rate, 54. Highest pulse-rate, 180. In addition to quinine in effervescence had 1-minim doses of tincture of aconite every three hours for three doses only. House physician's note: "Brought down temperature from 104° to 101°." Convalescence rapid and uninterrupted.

It will be seen that three doses of *tincture of aconite*—1 minim every three hours—were given to case No. 3, and the house physician added this note, "Brought down temperature from 104° to 101°."

We do not advocate the use of aconite *generally* in pneumonia; indeed, we are strongly *opposed* to its continued use as a routine remedy, or to more than a limited number of small doses. But given in small doses to children and young people at the very onset of an attack, and for twelve to twenty-four hours only, we are bound to bear testimony to its remarkably good effects. We have not seen any particularly good result follow its use in adults, and we should consider its administration most unjustifiable in aged people. But it has some subtle influence, which we are quite unable to explain, over many of the febrile affections of children and young people. It allays the distressing sense of heat, it calms restlessness, and it promotes sleep.

We give from 1 to 3 minims of the tincture every three or four hours for three to six doses, or one of Schiefflin's pilules of *aconitine*, each containing $\frac{1}{460}$ of a grain. We never give more than six doses; and we restrict its use to the first forty-eight hours of the illness.

But to return to the question of the administration of *quinine* in pneumonia. Jurgensen,* who is one of the strongest advocates of the use of quinine in this disease, seems to regard it simply as a reducer of temperature. He is a warm advocate of an *antipyretic* treatment of pneumonia, because he considers the *pyrexia* causes cardiac exhaustion, and that failure of heart power is *the* special and particular danger we have to combat. But it is clear that if quinine antagonises the activities of an infective organism upon which the *pyrexia* and all the disturbances connected with it depend—and there is as much reason for supposing that quinine acts in this way as in any other,—then the value of quinine as an antipyretic must be far greater than that of a *mere* depressor of temperature—as, for instance, the cold bath—for not only, on this hypothesis, does it lower the temperature, but it acts also as a direct antagonist to the fever-causing agent in the body.

He says, and says truly, "Quinine above all other antipyretic medicines possesses the invaluable advantage of reducing the temperature without injuring the heart, and this it accomplishes by diminishing the production of heat. . . . When properly used quinine diminishes the temperature for at least twelve hours." But he has been led to give this drug in doses which we consider far too large. "Where the fever is intense," he says, "77 grains may be given to a strong adult, and 15 grains to a child under one year, *always in one dose*. . . . I know that many will be alarmed at such large doses. My teacher is experience. Only fools resist facts."

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* Von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. v. p. 164.

We give in a severe case 3 grains of quinine every three hours—that would amount to 24 grains in twenty-four hours. We have never found the slightest difficulty at any time in assuring the toleration of these doses, and we have never had to have recourse to rectal injections of quinine as Jurgensen has.

Professor Loomis* also advocates the employment of quinine as an *antipyretic* in pneumonia, and maintains that "it has been found to reduce temperature more permanently and with greater certainty than any other agent." But Loomis, like Jurgensen, has, we consider, been in error in thinking it needful to give very large doses. If the method be followed that we have suggested, we are convinced these large doses will not be required.

Nothing can be more unsatisfactory than Dujardin-Beaumetz's treatment of the subject of the use of quinine in pneumonia. For what reason quinine should be grouped with blood-letting, antimony, and veratrine, amongst the "*médications spoliatrices*,"† it is difficult to understand. Nor does he offer any arguments or facts in support of his opinion that its administration in large doses is "a dangerous practice," and that it is a drug whose employment should be excluded from the treatment of pneumonia.

It will be seen that we have brought the use of quinine in pneumonia under the first indication, "to endeavour, if possible, to *antagonise*, the *injurious influences* of the *specific infective organism* on the blood and the tissues." We regard its action in pneumonia as *analogous* to its action in ague, and we do not give it, as we have already said, simply as an antipyretic. Finally, we may remark that all physicians are agreed that quinine must be given freely in those forms of pneumonia which arise in association with exposure to malarial influences.

Various *antiseptic* agents have been suggested for the cure of pneumonia, with the idea of their exerting a *germicidal* action; such as sodium benzoate, iodine, ethylic iodide, the salicylates and carbolic acid. We are not aware that any particularly good effects have been obtained from the use of these agents; *iodine*, and inhalations of ethylic iodide, however, have been said to yield some satisfactory results.* We should be disposed to place the *inhalation* of *turpentine*, which has been advocated in pneumonia, amongst the *antiseptic* agents. Equal parts of turpentine, oil, and glycerine have been mixed with three times as much distilled water, and used as a spray in Lewin's steam atomiser. Such a mixture is inhaled for five to ten minutes five or six times a day. The patient is directed to take, from time to time, five or six very deep inspirations. In the intervals he should breathe in the ordinary way. It is said to stimulate respiration and to exercise a favourable influence on the general course of the disease.

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* Pepper's "System of Practical Medicine," p. 350.

† "Leçons de Clinique Thérapeutique," vol. ii. p. 387.

Some German observers † think they have been able to discover that when the specific "pneumococcus" enters the body of an animal it generates a poison, which they have named "*pneumotoxin*," and that the pneumonic fever depends upon the presence in the blood of this substance: that after a few days another substance, which they term "*anti-pneumotoxin*," is formed, which neutralises the pneumotoxin and arrests the pyrexia. As soon as sufficient anti-pneumotoxin has been produced to neutralise the pneumotoxin the "crisis" takes place. Animals may be rendered "immune" by the inoculation of any nutrient medium in which the "pneumococcus" has been cultivated. The serum of such an immune animal contains anti-pneumotoxin, and may therefore be used to cure pneumonic intoxication.

Cases of acute pneumonia have been reported as having been *averted* by large doses of *calomel*, 20 grains, every three hours—indeed, an initial dose of 60 grains has been given, followed by 30 grains every three hours—and rapid recovery is reported.* It is quite possible that calomel in large doses may have an *antiseptic* action in pneumonia, but the fact cannot be said to be established.

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* Hare's "System of Practical Therapeutics," vol. ii. pp. 595, 596.

† G. and F. Klemperer, *Berl. Klin. Woch.*, Aug. 24 and 31, 1891.

We may now pass on to the consideration of the *second indication*, viz.: *To relieve and to endeavour to subdue dangerous and distressing symptoms.*

The first of these we shall consider is **pyrexia** or *hyperpyrexia.*

Jurgensen maintains, as we have already stated, that the chief end to be aimed at by treatment in pneumonia is the reduction of temperature, as the chief danger is from cardiac asthenia, determined, in part, by the obstruction to the circulation presented by the pulmonary lesion; and that the continuance of the fever is especially dangerous to the force and integrity of the cardiac muscle. Wilson Fox,† however, doubted, and we are disposed to share the doubt, whether the high temperature has a greater influence in causing cardiac failure than the action of the specific poison on the nervous system; the state of the pulse may, therefore, be taken as a better guide to treatment than the temperature. Wilson Fox's experience also led him to the conclusion that a temperature up to 105° F. has very little apparent influence on the mortality in pneumonia, and that deaths at a temperature below are nearly as frequent as above 105°; the mortality depending chiefly on age, on complications, or on preceding, or co-existing debility, from whatever cause, or from the amount of lung implicated, and especially from the implication of both lungs.

A careful examination of the evidence of the effects of the **cold bath** in the treatment of pneumonia is not so satisfactory as to warrant its general employment or recommendation. For, although the statistics published by some Continental practitioners show fairly good results, it must be borne in mind, as has been pointed out by Wilson Fox, that in some conditions, such as great debility, extent of lung involved, rapidity of respiration, advanced age, and the alcoholic habit, "which must increase the danger from pneumonia, this treatment has been considered inapplicable by those who have most largely employed it;" so that it has really been tested, chiefly in *selected* cases; and Wilson Fox came to the conclusion that "cold bathing does not diminish the mortality of cases with temperatures above 104° F." He thought the method useful, however, in a few cases of pneumonia in childhood with danger of collapse of adjacent portions of lung. "The effect of the cold bath in advancing cyanosis is of the most markedly beneficial kind. It causes deep inspiration and the refilling of the lung, and may be, occasionally, the means of saving life." He thought, however, an ice cap, and a spinal ice-bag, in some cases, was often useful in allaying nervous excitement, as well as in lowering temperature and diminishing the rapidity and improving the strength of the pulse; and he also approved of a water bed, through which a stream of cold water is kept constantly flowing.

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* Dr. Strong, *New York Med. Record*, March 16, 1889.

† "Diseases of the Lungs," p. 363.

The cold bath has been found to be dangerous in some cases, and its application has been attended by shock, collapse, and return of rigors.

Professor Loomis* is opposed to the cold bath treatment of pneumonia. He has found that with its use "the pneumonia is more liable to extend; that the shock of cold to the surface causes a nervous depression from which the old and feeble do not rally; that, although a reduction of temperature may be effected, heart-insufficiency is more rapidly reached and is more difficult to overcome."

Dujardin-Beaumetz also pronounces against it.

We are not ourselves partisans of the cold bath treatment of pneumonia : its *routine* application to all cases where the temperature is not more than 102° or 103°, as has been advocated, we consider wholly unnecessary and unjustifiable. The arguments that have been used in favour of expectancy, and in opposition to drug, or other active treatment, will certainly apply with quite equal force to the routine use of the cold bath.

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* Pepper's "System of Medicine," vol. iii. p. 350.

The *local* application of cold, however, has had a number of advocates. The practice of applying cold to the surface of the chest over the affected lung originated no doubt in the idea that it would influence favourably the local pulmonary lesion, and also relieve the pleuritic pain. But it seems far more probable that it acts as an antipyretic, and influences favourably the course of the pyrexia. Niemeyer was a warm supporter of this mode of treatment, and regarded it as of great value in relieving pain, in lowering somewhat the temperature, and in abbreviating the course of the disease. He used cold compresses to the affected side, which were frequently renewed. The application of an *ice-bag* has been suggested as a great improvement on this method, as it does not need frequent renewal as the cold compresses do. Dr. D. B. Lees * has published a series (eighteen) of cases of pneumonia and broncho-pneumonia in which he applied the ice-bag with much success.

There appears to be some risk of chill and collapse if this treatment is applied to feeble children, and the temperature in all cases should be frequently taken during its application, and the ice-bag should be removed if it fall below 100°, and it may be reapplied if the temperature rises again to above 102°. The ice-bag should not be applied over the præcordial region, as it is liable to exercise a depressing influence on the heart. If symptoms of cardiac depression appear brandy must be given and heat applied to the extremities.

Dr. Lees has the chest covered with strapping before he applies the ice-bag. The local application of ice to the chest or to the spine certainly has a powerful influence over the temperature in this disease, and appears to subdue the pyrexia quite as surely as cold baths, while it is much more convenient to apply and far less exhausting to the patient.

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* *Lancet*, Nov. 2, 1889.

Many **drugs** have been advocated to reduce the fever in acute pneumonia; of the use of *aconite* we have already expressed our opinion. *Veratria* is another drug which has been largely used to bring down the pyrexia and pulse-rate in pneumonia, and this it certainly does; but its use is attended with danger, as it is apt to cause collapse, with sickness and purging, and its use would, therefore, have to be restricted to those very cases which are known to do well without any active treatment.

Digitalis is another drug, the use of which has been greatly extolled in the treatment of pneumonia, and it has this advantage, that while it reduces the temperature and the pulse-rate, in moderate doses it acts as a tonic to the heart. We have nothing to say in favour of the *large* doses advocated by some German physicians, nor of its routine use. Niemeyer considered its use indicated whenever the pulse was of great rapidity. He gave it in infusion combined with some neutral salt of potash or soda. Jaccoud approves of its use, and considers its good effect is chiefly confined to lowering the temperature. Professor Loomis maintains that "it not only lowers the temperature, but lessens the frequency of the pulse and steadies it, and produces in the majority of cases its well-known tonic action on the heart." *

The great tolerance of this drug in pneumonia has no doubt led to the giving of unduly large doses. We should recommend that the doses given should not exceed 2 drams to ½ ounce of the infusion, or 10 to 20 minims of the tincture. These doses may be given together with 20 or 30 grains of potassium citrate or sodium tartrate. Wilson Fox refers to the tendency digitalis has to intensify or prolong the great critical fall of temperature "a result by no means to be desired," and he would limit its use to those cases where at an early period there is remarkable frequency and feebleness of pulse, and in cases where, owing to circulatory feebleness, the expectoration is profuse and bloody. He also advocates its use in alcoholic cases, especially when attended with profuse sweatings; in such cases the "benefit from its use has been of the most marked nature," given together with alcoholic stimulants.

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* Pepper's "System of Practical Medicine," vol. iii. p. 347.

As digitalis is often somewhat slow in its action its effects must be carefully watched. It should not be given to old people.

Professor Petresco* is one of the most recent advocates of the use of digitalis in pneumonia. He has often seen it cut short the disease in three days, and the physical signs and the fever disappear rapidly. In short, digitalis is a drug from which much good may be obtained in the treatment of pneumonia, but its use requires great discrimination.

We are not greatly in favour of the use of the more recently introduced antipyretic drugs in the treatment of a disease like pneumonia on account of the cardiac depression they not infrequently produce. Some respectable authorities, however, recommend the use of *antipyrin* in cases of *hyperpyrexia*. Dujardin-Beaumetz gives 7½ grains every three hours until a notable fall in the temperature is observed. Dr. E. E. Graham† thinks he has observed good effects in hyperpyretic cases by the administration of this drug in 5-grain doses, "guarded by 3 grains of sulphate of quinine," every half hour for three doses. In the pneumonia of children antipyrin has been said to allay restlessness, quiet delirium and cough, and promote sleep, as well as reduce temperature; it has been given in 2- to 6-grain doses every six or eight hours according to the age of the child.

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* *Therapeutic Gazette*, 1889.

† Hare's "System of Practical Therapeutics," vol. ii. p. 592.

Many physicians prefer *phenacetin* to antipyrin as a depressor of temperature. It is said not to have the same tendency to cause cardiac debility. We gave it with excellent results in a very severe case of influenzal pneumonia. The case was one of the most severe forms of influenza we have seen. The temperature reached 106°. There was extensive pneumonic consolidation of one lung, the lower two-thirds, and congestive hyperæmia, with dulness and œdematous crepitation at the base of the other lung. There was active delirium. The tongue was dry and furred, the respirations 60. The patient—a young woman—was given 1 grain of phenacetin with 1 grain of hydrobromate of quinine every hour for nearly three days, during which the temperature fell, the delirium disappeared, and the lung began to clear, and she made a rapid and uninterrupted recovery. She was watched very carefully for any signs of cardiac depression while she was taking the phenacetin, but no sign of any such effect was observed.

Sodium salicylate has been advocated by some as of value in the pyrexial stage of pneumonia. It is, in our opinion, too depressing a drug to be used in pneumonia.

Pain, which is due to accompanying pleuritis, is a symptom we should do our best to relieve; for, not only does it tend to exhaust the patient by preventing sleep and causing restlessness, but it aggravates the dyspnœa by inducing the patient to make very shallow inspirations for fear of increasing the pain. The application of three to six leeches, followed by a hot linseed poultice sprinkled with laudanum, is one of the best remedies. At night 10 grains of Dover's powder in a draught with 3 drams of solution of acetate of ammonia, and 1 ounce of camphor water is also useful. This is safer than a hypodermic injection of morphine, for in some cases morphine will cause great cardiac depression, and it must, therefore, on no account be given to feeble and aged patients. Ice-bags and ice poultices, together with the application of strapping to the chest have been found effectual also.

Inhalations of chloroform[*] have been used with success for the relief of the pleuritic pain in pneumonia. Oertel recommends repeated inhalations of equal parts of vapour of chloroform and atmospheric air, stopping short of complete narcosis. "Under the influence of chloroform the pain attending the inspirations gradually diminishes, and they become deeper. The frequency of respiration is lessened, and the exchange of gases proceeds freely; the cyanosis disappears, and the danger from insufficient respiration may be kept at bay till the crisis is past."[†]

Dyspnœa, when it occurs in an aggravated form, with extremely rapid, shallow respirations, and accompanied by cyanosis, is one of the most serious symptoms we have to combat in pneumonia. It is usually dependent on the rapid extension of the pneumonic infiltration, so that a large tract of lung becomes infiltrated and rendered useless for respiration. Owing to the obstruction this also offers to the circulation through the lung, the right side of the heart becomes distended and the pulse small, weak, and rapid. In more advanced stages of the disease collateral congestion and œdema of the lung may have more to do with the causation of the dyspnœa than the extent of pneumonic infiltration. There is also a nervous form of dyspnœa, due it is believed to an intense action of the blood-poison on the nervous system, and characterised by extremely rapid respirations, and by the absence of the marked cyanosis which accompanies the preceding form.

In the first of these forms of dyspnœa *blood-letting* is indicated, in order to afford immediate relief to the over-distended right heart. From 4 to 10 ounces of blood should be withdrawn from a vein in the arm; in feeble persons not more than 4 ounces, in the robust 8 or 10 ounces. This measure usually affords temporary relief, and so time is gained for the application of other remedies, and this, indeed, is the chief value of venesection; for its remedial effect is often brief, and if it be repeated frequently it will compromise the patient's chances of recovery by directly contributing to cardiac asthenia. Stimulants, therefore, must at the same time be given, and ether and digitalis to maintain the cardiac action.

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[*] Inhalations of chloroform mixed with rectified spirit have been said to cut short attacks of pneumonia (Clemens, *Therap. Monat.*, p. 117, 1889) and arrest the development of its usual signs. If this should prove to be the case, it would probably be due to the antiseptic action of the chloroform vapour.

[†] Oertel's "Respiratory Therapeutics," p. 328. Author's translation.

The *hypodermic injection of strychnine* is a valuable resource in these cases of grave dyspnœa with struggling cardiac action; from $\frac{1}{64}$ to $\frac{1}{32}$ of a grain may be given at intervals of an hour for three or four doses. *Inhalation of oxygen* has also been found of great value in maintaining life under such conditions, but it should be *continuous*, for even after it has caused a complete rally, and the danger seems to have been overcome, the dyspnœa and cyanosis are apt to quickly return on the discontinuance of the inhalation of the gas. Its use has been continued for four days and nights by one practitioner, and for 106 hours by another, in the latter instance an average of 200 gallons of the gas was consumed in twenty-four hours.

Dry-cupping has been found useful by some physicians. Wilson Fox thought dyspnœa in children was best treated by the cold bath, as we have already stated.

The *nervous* form of dyspnœa may be relieved by morphine and ether; $\frac{1}{4}$ of a grain of hydrochlorate of morphine and $\frac{1}{2}$ dram of spirits of ether may be given in 1 ounce of peppermint water, and repeated if needful; or $\frac{1}{6}$ of a grain of morphine may be injected hypodermically.

Professor Loomis strongly advocates the use of *opium* to lessen the *nervous shock* in the *early* stage of acute pneumonia. He says, "If the patient is brought under the full influence of opium, and held in a condition of comparative comfort by hypodermic injections of morphine, repeated at regular intervals, he is placed in the best condition not only for resisting the shock, but also for combating the activity of the pneumonia. . . It very greatly diminishes the chances of heart-failure, cases often recovering under its use, which from age and condition of life seemed hopeless."* We can readily believe that this may be true of patients with irritable nervous systems and of excitable temperament, but we are sure that it is not a method to be entrusted to any but very experienced practitioners, who have learnt by long observation both the dangers and advantages to be derived from the use of this drug, and who know how very badly it is tolerated by some constitutions.

Delirium, when it occurs early, as it is apt to do in the course of pneumonia, is usually dependent on the intensity of the fever, and on the severity of the action of the fever poison on the nervous system. At this period it is best dealt with by such means as reduce the pyrexia, and these we have already detailed; an ice-cap to the head, or an ice-bag to the spine, or the local or general application of cold, or the use of the antipyretics referred to above. But when the delirium depends on a special excitability of the nervous system, or on exhaustion, some special means must be adopted for its relief. *Musk* was a favourite remedy with Trousseau for this symptom, given in 5-grain doses, and Professor H. C. Wood has also advocated its use given in 10- to 15-grain doses, by rectal injection, suspended in mucilage, every six hours. A more trustworthy remedy is a combination of chloral and bromide of potassium; 20 grains of the former and 30 grains of the latter drug should be given at once, dissolved in an ounce of camphor water, and repeated when necessary. The delirium that accompanies exhaustion, and that is associated with threatened cardiac failure, will demand the same kind of stimulating treatment, which we shall presently consider.

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* Pepper's "System of Practical Medicine," vol. iii, p. 318.

Sleeplessness may precede and accompany the delirium, and requires similar management; but when it is dependent on *pain*, *cough*, *dyspnœa*, or *exhaustion*, it can, obviously, only be relieved by remedies which relieve these other symptoms and states. The surroundings of the patient should, of course, be such as tend to promote sleep: a quiet, cool, dark room, a comfortable bed, etc.*

Cough is a symptom which, when frequent and distressing, may require treatment. So long as the cough is attended by expectoration of the peculiar pneumonic sputum, or of frothy mucus from co-existing bronchial catarrh, it would obviously be mischievous to give sedatives to arrest it. Such a cough is essential and useful for clearing the air-passages of obstructive secretion. But it sometimes happens that there is much and distressing irritative cough, unattended by expectoration; this may be due to the extreme viscidity and tenacity of the sputa, and the consequent difficulty in detaching them and expelling them from the air-passages, or it may depend on some laryngeal irritation which may be the seat of a co-incident dry catarrh. A cough of this kind if left unrelieved will add greatly to the patient's distress and exhaustion, as it will prevent sleep, and the mere muscular efforts of ineffectual coughing are most exhausting. If the cough is due to the difficulty of expelling dry viscid sputum then warm alkaline sprays (Ems, or Vichy, or Bourboule water are suitable) will be found most useful. The following is a very good formula:

℞ Sodii bicarb.	10 grains.
Ammonii chlor.	5 ,,
Glycer. acid. carbol.	½ dram.
Aquæ laurocerasi	ad 1 oz.

M. f. inhal.

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* A cool bed is a great comfort to the over-heated patient, with hot, burning skin, and it promotes sleep; it can be provided by covering the patient with a cradle, which takes off the weight and contact of the bed-clothes, and suspending to the bars of the cradle small *ice-pails* filled with ice, as suggested by Dr. Fenwick.

This should be applied hot in a Siegle's steam spray-producer. At the same time the patient should be given an occasional drink of alkaline water (Ems, Vichy), mixed with a little hot milk and a teaspoonful or two of brandy or whisky. If this fails to relieve, and the cough seems due to laryngeal irritation, from 2 to 5 grains of Dover's powder mixed with a little chloroform water, may be given occasionally; small doses of tartar emetic are often extremely useful in allaying this symptom. A teaspoonful occasionally of the following linctus will rarely fail to relieve such a cough:

℞ Vini antimonialis	... 120 minims.
Ammonii carb.	... 18 grains.
Liq. morphinæ hydrochlor....	... 60 minims.
Aquæ laurocerasi	... 4 drams.
Syrupi simp.	ad 1½ oz.

M. f. linctus. One teaspoonful for a dose.

Gastric catarrh of an acute form, and **diarrhœa** are apt occasionally to occur in some cases of acute pneumonia, which for this reason have been termed cases of *bilious pneumonia.* These symptoms are not infrequently induced by injudicious feeding; by an over-anxiety to give food when the stomach is not in a state to digest it, when the tongue is thickly coated, and the mouth foul and covered with a dryish sticky secretion. Vomiting will occur in such circumstances, and sometimes diarrhœa. To prevent these symptoms it is a good plan, if we see the case early, to give, at the very onset, a grain or two of calomel followed by a saline aperient, so as to sweep away any foul irritating substances that may be retained in the alimentary canal; or the same remedy may be applied when the symptoms of gastric catarrh present themselves. The food should be restricted to milk well diluted with water, and containing 10 or 15 grains of bicarbonate of soda to each cupful, or the milk may be diluted with two-thirds Vichy or Apollinaris water. A little water arrowroot with a small quantity of brandy may also be occasionally given. A mustard plaster to the epigastrium will relieve the tendency to vomiting. It will rarely be necessary to have recourse to any other means than these to relieve the gastric catarrh and arrest the *diarrhœa.* If the latter symptom, however, should be troublesome, it can usually be controlled by a few doses of Dover's powder (2 to 5 grains) with bismuth subnitrate (5 to 10 grains).

We now reach the third indication, "*To support the patient's strength, and to endeavour to remove or moderate all conditions tending to exhaustion.*" Some of the means at our disposal for responding to this indication have already been considered in the preceding remarks on the treatment of symptoms.

It is generally admitted that the great danger to life in pneumonia is the tendency to **cardiac failure,** and it is to prevent this, in the last stage of the disease, that all our efforts must be directed.

It is hardly necessary to point out that the patient should be kept absolutely at rest in a comfortable bed (in an airy, well-ventilated room, and as quiet as possible). He should not be disturbed unnecessarily, or moved about, and exhausted by too frequent physical examination. His diet should be fluid, and light, and adapted to the enfeebled digestive powers, and to the febrile state. Milk, well diluted with water, or some effervescing alkaline water when there is any tendency to sickness, is a good and convenient food. The occasional vomiting of *coagulated* milk should be carefully noted, for it then usually requires further dilution with some alkaline water, or it should be peptonised. Light clear soups and broths may also be given, and there is no harm in a cup of well-made tea or coffee now and then, and they are both cardiac stimulants. Strong coffee is too little used in these cases. It has a tonic effect on the heart. Thirst may be allayed, and the mouth kept clean and moist by sipping iced lemonade, toast and water, or barley water, according to choice.

When more stimulating food seems called for, eggs may be given beaten up with boiling water, and one or two dessertspoonfuls of brandy or whisky added. Strong beef-tea, or meat juice, and arrowroot may also be given with some added spirit in the same way. If there is co-existent bronchial catarrh, and the expectoration is viscid and difficult of expulsion, hot milk and seltzer water in equal parts, with two or three teaspoonfuls of brandy, serves both as a stimulating food and a useful expectorant.

With regard to the use of **alcoholic stimulants,** we are convinced that in more than two-thirds of the cases of acute pneumonia, as they are generally encountered, there is no need of them whatever. The routine administration of alcohol in pneumonia, especially in the early stages, with the idea of preventing cardiac failure later is, we think, a *serious error.* Alcohol produces vaso-motor *paresis,* and causes dilatation of the vessels, and it must, therefore, aggravate or induce tendencies to vascular engorgement. It acts like a poison to many persons, and causes considerable nervous and general depression after its first stimulating effect passes off; it increases the amount of toxic substances in the blood, and the elimination of considerable quantities of alcohol must impose a severe strain on the already overtaxed organs of excretion. When we further consider the large quantity of *impure* spirit*—brandy and whisky—which must be used in hospital practice—for the pure and best kinds are very costly—we are disposed to believe that some of the more serious forms of cardiac failure, with albuminuria and gastric and hepatic congestion, encountered in the later stage of pneumonia are, to a certain extent, contributed to by the excessive and premature use of impure alcohol.

The *early* routine use of alcohol takes from us also the power of resorting to it as a fresh resource in advanced stages, when in exceptional cases it may be of undoubted use.

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* Dujardin-Beaumetz, in order to avoid the use of these impure spirits—the injurious effects of which he has had occasion to note—advises the use of the stronger French and Spanish wines in their place. ("Clinique Therapeutique," vol. ii. p. 433.)

The very same objection that has been made to inferring from results as to the value of any particular remedy in a disease like pneumonia, with so strong a tendency to terminate in a rapid crisis and complete recovery, must apply with equal force to the inferences that have been drawn from the routine use of alcohol. In well-marked adynamic cases, however, the use of alcohol is indicated, and we should make some efforts to obtain it pure. In the pneumonia of drunkards, and of the aged, it is especially needed. We should begin with moderate amounts—4 to 6 ounces of whisky or brandy in twenty-four hours—and increase them if necessary. Dr. Wilson Fox thus formulates the indications for its use: "rapidity, irregularity, intermittence, and dicrotism of pulse, great rapidity of respiration, cyanosis with a rapid, feeble pulse, irregularity of breathing, and signs of pulmonary œdema, tremor, subsultus, muttering delirium, or delirium in patients addicted to alcoholism, and profuse sweating during the febrile period, are all indications for alcohol. When these symptoms are severe alcohol must occasionally be used unflinchingly and unsparingly." *

A moderate amount of alcoholic stimulant in the form of good sound wine, such as port or burgundy, or champagne if it is preferred, or 2 or 3 ounces of whisky or brandy in the day, is often needed after the crisis, and during convalescence. It will then be of much help in restoring the strength of the patient.

It has been suggested that in cases of threatened cardiac failure from over-distension of the right heart, *nitro-glycerine* or *sodium nitrite* may be useful. Dr. A. H. Smith† urges that the action of *nitro-glycerine* in dilating the blood-vessels, when there is great congestion of the venous system, leads to a more even distribution of blood in the arteries and veins, and so, at least, for a time, helps the right heart. He claims to have obtained excellent results from one-drop doses of a 1 per cent. solution given every quarter or half hour. Dr. Graham has found five-drop doses of tincture of digitalis combined with $\frac{1}{60}$-grain doses of sulphate of strychnine four times a day "steady the heart, slow the pulse, change the character of the heart-sounds, and produce its well-known tonic action on the heart muscle." *

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* "Diseases of the Lungs," p. 372.

† *Amer. Journ. Med. Sc.*, Oct., 1890.

Cardiac failure may arise in two ways: either, owing to the extent of the pneumonic consolidation of the lung, and the obstruction to the circulation in the pulmonary vessels and the venous system generally, so produced, the right side of the heart becomes over-distended, and there is a tendency to clotting in the right heart and arrest in diastole; or, owing to the intensity of the septic infection and the pyrexia, there is a *general* loss of cardiac power with well-marked nervous disturbance, and great *general* prostration. We have already alluded to the possible usefulness of *venesection* when the first form of cardiac failure is seen to be impending; the great objection to its employment, except in vigorous persons, and in small amount, is that if it fails to help the struggling heart over the critical period, it may leave the patient in a worse condition to struggle through the final stage of the disease than before. With this exception, the treatment of both forms of cardiac failure is the same.

It has long been the custom to employ hypodermic injections of ether to stimulate the heart in these grave cases of adynamic pneumonia, 20 to 30 minims, quickly repeated if necessary; this (and strychnine also) has been found a valuable resource in many instances. Huchard combines injections of *caffeine* with injections of ether. He believes the former to be purely tonic to the heart, whereas the latter is only stimulating. He dissolves the caffeine for this purpose in distilled water with the aid of sodium salicylate—a dram of caffeine, and 45 grains of sodium salicylate are dissolved in $1\frac{1}{2}$ dram of warm distilled water—one-tenth of this, containing 6 grains of caffeine, is injected at a time, and may be repeated six or eight times in twenty-four hours.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 594.

Some consider that means for *disinfection* should be applied in cases of pneumonia, more especially in its epidemic forms; the linen should be treated as in other infectious diseases, and the sputa should be destroyed. As it seems possible that the germs may linger in the mouth in a state of activity, this cavity should be disinfected by means of antiseptic mouth washes; this would lessen the danger of relapse and the risk of infecting others.

Convalescence from acute pneumonia is often rapid and uninterrupted, at other times, especially if the acute period has been prolonged, and the *crisis* late, or if the pyrexia has terminated gradually and not by crisis, the convalescence may be protracted, and requires care and watching. A light sustaining diet, with a moderate amount of wine, or other stimulant, will be needed, as well as quinine, strychnine, and iron as tonics, and a slow disappearance of the lung infiltration may require the application of a few flying blisters, or iodine paint over the area of dulness. We have, in common with Dujardin-Beaumetz, E. E. Graham, and many other authorities found such counter-irritation promote the disappearance of the exudation; indeed, we regard this as the especial use of counter-irritation and, in ordinary cases, we reserve its application to this stage of the disease. In strumous cases we have seen iodide of iron in combination with cod-liver oil of much use in quickening the disappearance of the exudation, and the complete clearing up of the lung. It will often, however, be necessary to have recourse to change of air, to removal to the seaside or to some bracing mountain resort, to completely restore the affected lung to a healthy condition.

CATARRHAL, LOBULAR, OR BRONCHO-PNEUMONIA.

Cases of this form of pneumonia differ in many respects from the preceding,—in their mode of origin, in their course and termination, in their anatomical lesions, and in their symptoms and physical signs.

The **indications** for **treatment** will also differ somewhat.

They usually *originate* in a pre-existing bronchitis, the inflammation of the bronchioles extending to the contiguous air-cells, and they are, therefore, **caused** by the same conditions as induce bronchitis; and these we have already considered. They are, however, very prone to occur in those forms of bronchitis which accompany the infective fevers, such as measles, whooping cough, influenza, diphtheria, etc., and especially when these diseases attack children, or others who are living in unfavourable hygienic conditions.

They are very common in *early childhood*, but they are not so generally restricted to that period as has been thought. In epidemics of influenza they occur at all ages, and they are common in old age and in debilitated states. The existence of heart disease and pulmonary emphysema favour their occurrence. Constitutional syphilis, scrofula, and rachitis in children predispose to these attacks.

They differ *in their course;* the invasion is usually gradual, and not sudden, being preceded by the ordinary signs of bronchitis. They run no definite cyclical or typical course, as do cases of lobar pneumonia; their course is variable and irregular, sometimes terminating fatally in a few days, sometimes lasting many weeks, and ending in a slow and gradual convalescence. The mortality is much greater.

They differ in the characteristic *anatomical lesions*, and their distribution. The inflammation, creeping on from the bronchioles, affects scattered groups of lobules, hence the name *lobular;* these, however, may coalesce, and so considerable tracts of lung tissue may be affected. This becomes associated, to a greater or less extent, with collapse of other lobules, an important lesion the mode of occurrence of which we need not now stay to explain. But these collapsed air-cells are apt themselves to become the seat of pneumonia. The *exudation* into the air-cells differs also from that of croupous pneumonia in being composed chiefly of epithelial cells, and the cells of catarrhal bronchitic exudation drawn into them during inspiration, together with leucocytes, a few red blood corpuscles, and only a scanty proportion of fibrin. The bronchial tubes are prone to undergo dilatation, especially small globular dilatation of the fine tubes. These *scattered* lesions usually affect *both* lungs, so that the disease is commonly bilateral. The bronchial glands are usually affected and become inflamed and swollen.

The secondary lesions, such as dilatation of the right side of the heart, and congestion of the liver, stomach, and kidneys, depend on the obstruction to the pulmonary circulation.

They differ in their *symptoms* and *physical* signs; these are, of course, to some extent, those of the accompanying and antecedent bronchitis, and they vary greatly in their severity, according to the extent and intensity of the local inflammation or the attendant constitutional state. The *cough* is usually an important and troublesome symptom, and is apt to occur in severe suffocative paroxysms. The *dyspnœa* may be very great, and the respirations very rapid, rising even to 100 in the minute, according to the amount of obstruction to the access of air to the air-cells. The expiration is usually prolonged and laboured. The *sputa* are bronchitic or puriform, not rusty; they are very tenacious, and young children rarely expectorate them.

The *fever* is somewhat irregular; at first the temperature may be that of acute bronchitis, or of the infective disease of which it is a complication, and may not exceed 102° to 103°. Subsequently it may rise to 104° or 105°, and there are often considerable daily fluctuations. The defervescence is gradual and not by crisis. When the temperature is high, and the respirations are rapid, the pulse is also very quick, and usually small and feeble, and may reach 160 to 200; the face is cyanosed. In severe cases there is also marked tendency to *gastro-intestinal catarrh*, with great thirst, a brown and dry tongue, and *diarrhœa*, and there is likewise a great tendency to cerebral disturbance, restlessness, delirium, convulsions, stupor, and coma.

In cases that recover the convalescence is not so rapid as in lobar pneumonia, nor is it often so complete. Recovery is gradual, and there is a certain tendency to the sequence of chronic pulmonary disease, or the development of rachitis, or the occurrence of gastro-intestinal irritation.

The *physical signs* differ from those of croupous pneumonia. There are, of course, those of the coexisting bronchitis—viz. sonorous and sibilant, dry and moist *râles* heard over the greater part of the chest; and there may also be the signs due to catarrhal obstruction of the air-passages, and attendant collapse and emphysema, viz. immobility of the chest, and sinking in of the lower ribs.

But the physical signs dependent on the onset of this form of pneumonia are somewhat obscure, unless considerable areas of lung near the surface are involved. If the pneumonic spots are small in extent and surrounded by healthy lung, they will yield no characteristic signs to percussion or auscultation. The portions of lung, however, most liable to pulmonary collapse extend from the base upwards, in a somewhat conical form, along each side of the spine, and here gentle percussion may show the presence of dulness on both sides. Fine subcrepitant *râles* may also be heard over the dull areas with blowing expiration. The physical signs, however, of pulmonary consolidation are usually much less evident than in cases of croupous pneumonia, but careful and skilful percussion and auscultation will usually detect in some part of the chest the signs of spots of pneumonic infiltration.

From this brief sketch of the character and course of **broncho-pneumonia,** we may be assisted in formulating *indications for its* **treatment.**

The first of these is *to promote the removal of obstructions in the air-passages* and so *favour lung expansion*, and prevent the *extension of lung collapse.*

The second is *to relieve distressing and exhausting symptoms*, such as *cough*, *dyspnœa*, *fever*, *diarrhœa*, *cerebral irritation, etc.*

The third is *to support the strength of the patient*, and ward off debility and exhaustion by every possible means.

Obviously the remedies which will respond to the first indication will, to some extent, aid in the second, and those which answer to the first and second will further the third.

The first thing that will strike any observant practitioner in the care of cases of broncho-pneumonia is the desirability of the application of remedies that will promote the expulsion from the air-passages of the tenacious, adherent mucous secretion that is obstructing them. The whole series of morbid phenomena observed in these cases follow from this obstruction of the air-tubes.

Emetics have been recommended for this purpose, and especially ipecacuanha to promote the expulsion of the mucus that accumulates and obstructs the air-passages, and an occasional emetic of 10 to 20 grains of ipecacuanha powder, mixed with a little warm water and syrup, may with advantage be administered. The effect of the emetic is to relieve dyspnœa, to lessen cyanosis, and to prevent the tendency to collapse.

The hypodermic injection of *apomorphine* ($\frac{1}{12}$ grain for adults, $\frac{1}{30}$ for children) has been used and commended for this purpose, but it has been found to be occasionally attended by such very depressing effects, that it cannot be safely recommended for general application.

The drawback to the use of emetics is that they cannot be frequently repeated without producing much exhaustion, and that they are apt to excite gastric irritation to which there is a distinct predisposition in these cases. We have found another expedient most useful in promoting the expulsion of the mucus from the air-passages, and in lessening its viscidity. It is the use of *benzoate of soda* internally, and the frequent application of warm *alkaline sprays* containing some *glycerine of carbolic acid.* In these cases occurring in connection with infective diseases, the benefit attending this method of treatment will often be found remarkable, while it is a therapeutic method absolutely free from any possible objection.

From 5 to 20 grains of benzoate of soda, according to the age of the patient, with 1 to 4 drams of chloroform water, should be given every two or three hours, and a warm spray composed of 10 to 15 grains of bicarbonate of soda and 1 dram of glycerine of carbolic acid to each ounce of water should be freely sprayed in front of the mouth and nose of the child (when it is too young to inhale voluntarily), so as to be inhaled with the respired air. This can easily be arranged by mounting a good-sized Siegle's steam spray-producer at a suitable level, and allowing the steam spray to flow under the hood of the child's cot or to play freely in front of its mouth and nose. It is desirable in these cases that a flannel tent should surround the child's cot or bed so as to shut in this warm moist atmosphere, rendered additionally so if necessary by a steam-kettle. The increased fluidity which such an atmosphere gives to the bronchitic secretion is of the greatest importance in promoting its expulsion. Warm saline drinks serve the same purpose, and the patient should be made to drink frequently a small quantity of hot milk mixed with about twice as much seltzer or apollinaris water, to which a little whisky or brandy should be added, from ten drops to one or two teaspoonfuls, according to the age and condition of the patient. These measures afford relief also to the *cough*, the distressing paroxysms of which are caused by the violent expiratory efforts to expel the tenacious mucus adhering to the air-tubes and obstructing respiration. As these violent expiratory efforts tend to cause pulmonary collapse, it is important they should be moderated and controlled, and if the measures just described do not sufficiently control the cough some sedative must be cautiously administered for the purpose. The greatest caution must, however, be exercised in the use of opiates, lest they should by any means interfere with expectoration, and so add still further to the respiratory obstruction. This may best be obviated by giving very small doses, and combining them with expectorants and stimulants. One great advantage, which can scarcely be over-estimated, attending the occasional administration of minute doses of opium, is the relief to the restlessness and nervous disturbance it usually affords. Dover's powder in doses varying from $\frac{1}{4}$ to $1\frac{1}{2}$ grain may be given to children from 3 months to 5 years of age, with $\frac{1}{2}$ grain to 2 grains of ammonium carbonate, and a little syrup and water, once or twice in the twenty-four hours.

In older people, and in more chronic cases, the ordinary expectorant remedies may be prescribed, but we have found them of little use in young children who do not know how to expectorate. A useful form for adults is carbonate of ammonia, 5 grains ; chloride of ammonium, 10 grains ; ipecacuanha wine, 5 minims ; and infusion of senega, 1 ounce. This dose may be given three or four times a day.

Stimulating embrocations (the compound camphor, mustard, or turpentine liniments) to the chest are useful. We think well also of turpentine inhalation, and a ready and convenient method of applying it in the case of young children is to pour twenty or thirty drops of spirits of turpentine on a piece of lint tied loosely round the child's neck. A quilted cotton-wool jacket should be worn over the chest, and this we consider preferable to hot poultices, as the jacket admits of the application of liniments, or mustard, or iodine, whereas the wet poultice often gets cold, fatigues by its weight, leads to dangerous exposure in its renewal, and, if unskilfully made or applied, often slips and makes the patient damp and uncomfortable. However, the early application of a mustard plaster over the bases of the lungs has often proved useful, and if there is pleuritic pain a hot linseed poultice will usually relieve it.

In the **initial** stage, if there is much fever with a hot burning skin, a few small doses of tincture of aconite, $\frac{1}{4}$ of a minim to 1 minim according to the age of the child, every hour or two for three or four doses, with a little acetate of ammonia or citrate of potash, will often allay the fever in a remarkable way, and soothe the little patient greatly. Its use must be limited, however, exclusively to the early stage of the disease. We have not found quinine so invariably useful in this form of pneumonia as in the preceding, but most other authorities speak highly of its beneficial effects in some cases. Dr. E. E. Graham* says of it, " It is of special service in the young by controlling the pyrexia and pulse, sustaining the system, and possibly limiting the extension of the pneumonic process." Bartholow † also commends the use of quinine for reducing the pyrexia. He gives it in 5-grain doses, combined with $\frac{1}{4}$ grain of digitalis, three times a day for a child 2 years of age. We should not advise the use of such large doses as these, but should prefer giving it in the manner already described when speaking of its use in acute lobar pneumonia. Pepper‡ also approves of "a few full doses" of quinine to allay the fever. Wilson Fox likewise commends the administration of quinine, but rather as a tonic than as an antipyretic.* Graham and Pepper prescribe *antipyrin* also if quinine fails to reduce the temperature, the former giving doses of "5 grains of antipyrin, guarded by 3 grains of quinine."

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* Hare's "System of Practical Therapeutics," vol. ii. p. 601.

† "Practice of Medicine," p. 349. Philadelphia, 1892.

‡ "System of Practical Medicine," vol. iii. p. 371.

But one of the most approved methods of treating the pyrexia of catarrhal pneumonia is by the application of **cold**, either in the form of the cold bath or by local application to the chest. This treatment, advocated by Jurgensen, Bartels, Ziemssen, and many others, found a warm supporter in the late Dr. Wilson Fox. In serious febrile cases, with increasing cyanosis and dyspnœa, "immersion for a period of one to three minutes in a bath of a temperature of 65° to 70° Fahr. will," he says, "induce deeper inspiration, and apparently, as I have repeatedly witnessed, restore the vitality of the patient. . . Any prolonged immersion is undesirable in young children, though with recurring cyanosis the baths may be repeated." † He also approved of the local application of cold by means of cloths wrung out in cold water and applied to the chest and back, or the ice-bag in the manner already described; and observes of this method, "It appears to operate favourably in two directions—both by increasing the strength and depth and by lessening the frequency of the respiration, and also by the reduction which it effects in the temperature, a result which appears unattainable by any other agent, at least in an equal degree." It is of special value in promoting expansion of the lung, and warding off the danger of increasing collapse.

The reduction of temperature brought about by this method is often very considerable, but it is not permanent, for after a few hours the temperature rises again if the application of cold be intermitted, and several days of this treatment may be needed before a permanent reduction to normal is induced. The pulse- and respiration-rate also fall, and the cyanosis diminishes. But this method is not without risk and has to be watched carefully, for some patients are far more sensitive to the depressing effect of cold applications than others, and the long-continued application of cold has been observed to be followed by very serious symptoms of depression. When any signs of such depression are observed, such as pallor of the countenance, coldness of the surface, a small and very feeble pulse, the application of cold must at once be interrupted and stimulants freely given.

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* "Diseases of the Lungs," p. 400.

† *Ibid.*, p. 400.

We prefer the method of **cold affusion**—the dashing of cold water over the chest and spine—to that of immersion in the bath. The stimulating effect is greater, and it provokes, more completely, those fuller inspirations which are desired to overcome the danger of collapse. The lower part of the body may be immersed in hot water or hot mustard and water while these cold affusions are applied to the chest.

Leeches to the chest followed by poultices have been advocated by some physicians to relieve the dyspnœa attendant on pulmonary engorgement. We have not seen occasion to adopt this recommendation, nor can we advise it.

Any symptoms of *gastro-intestinal catarrh*, such as *vomiting* and *diarrhœa*, occurring in the course of the illness must be promptly relieved, because of their lowering tendency. If vomiting occurs early in the case, with a furred tongue and confined bowels, two or three small doses of calomel may be given with advantage—a ¼ or ½ a grain, with 2 to 5 grains of bicarbonate of soda, every four or five hours until the bowels have been freely moved. If there is also a tendency to diarrhœa, one or two of these powders may still be given; but should the diarrhœa continue, it will be necessary to replace them by others, each containing Dover's powder, ½ to 2 grains, according to the age of the child, with 2 to 4 grains of carbonate of bismuth, to be given twice daily until the diarrhœa ceases. Symptoms referrible to the *nervous system*—restlessness, delirium, etc.—may be so severe as to require treatment by sedatives. We have already spoken of the use of opium, and the caution necessary in its administration. Given, as already directed, in minimum doses and in combination with ammonia and ether, it is often valuable in allaying those nervous symptoms. Professor Pepper has found the following suppositories valuable in allaying extreme restlessness and sleeplessness : Asafœtida powdered 1 dram, sulphate of quinine 30 grains ; to be made into twelve suppositories with oil of theobroma, one to be introduced every three or four hours. He also recommends chloral hydrate in the form of enema, 5 grains for a child five years of age, and 20 grains for an adult. He says it affords great relief to the nervous symptoms. Active and restless *delirium* in the adult he has found quieted by hypodermic injections of *hyoscyamine*, $\frac{1}{80}$ to $\frac{1}{100}$ of a grain. Enemata of chloral and bromide, 5 to 20 grains of each, according to age, may also be used for the relief of this symptom. Professor H. C. Wood uses enemata of musk suspended in mucilage. But the most imperative indication in the more serious forms of this disease is to *energetically support the strength* of the patient and to overcome the tendency to respiratory failure. In addition to the measures already pointed out, there are still other means to which we may have recourse. Strychnine, as a stimulant to the respiratory centre and to the respiratory muscles, is a valuable remedy in these cases. It may be given in combination with bark, thus :

℞	Strychninæ	¼ grain.
	Acid. hydrochlor. diluti	1 dram.
	Spr. chloroformi...	4 drams.
	Extract. cinchonæ liquidi	3 „
	Aquæ	ad 4 oz.

M. f. mist. For a child five years of age a teaspoonful (= $\frac{1}{128}$ grain) may be given, in one or two of water, every three or four hours.

In urgent cases larger doses may be given, and preferably by hypodermic injection, so as to ensure a speedy effect. Pepper* states that he has given an adult as much as $\frac{1}{24}$ of a grain every four hours, day and night, for seventy-two or ninety-six hours.

Inhalation of oxygen may be administered with good effect when signs of asphyxia appear, but to be effectual it must be given long and continuously.

As cardiac stimulants, *ether* and *caffeine* may be given hypodermically, as already mentioned in treating of lobar pneumonia.

Alcoholic stimulation will be needed in most cases to prevent prostration and maintain the strength. In very young children 10 or 15 drops of brandy or whisky may be given in a few teaspoonfuls of hot milk and water every hour, and this dose may be increased to half a teaspoonful or a teaspoonful for older children. When collapse is threatened, brandy or whisky may be given hypodermically, or mixed with some fluid food, by the rectum.

The general hygienic surroundings of the patient must be carefully attended to. The air of the sick room must be raised to a temperature of between 65° and 70°, and whilst good ventilation is provided, all cold currents of air must be excluded. The diffusion of the vapour of water through the room by means of a steam-kettle should be steadily maintained; and by introducing a small piece of sponge or a roll of blotting-paper moistened with pinol or eucalyptol into the spout of the kettle, an agreeable and useful atmosphere for the patient is produced.

The food must be light and nourishing, good broths, beef tea, gruel, milk, whipped eggs with milk, or whey may be given. If there should be much gastric irritability, or difficulty in swallowing, from great dyspnœa, nutrient enemata must be administered.

The period of **convalescence** must be carefully watched, and tendencies to relapse guarded against.

In the cold and changeable seasons of the year it may be necessary to insist on keeping the house, choosing, if possible, a warm, airy, cheerful, and sunny apartment. To promote resolution of the infiltration, the application of iodine paint, or friction with liniments containing pine oil and iodine, may be found of service. Tonics will be needed to strengthen the circulation and restore loss of power, and help in throwing off the lingering catarrh. One of the best for this purpose is the *hypophosphite of lime* combined with quinine, iron, and strychnine. Arsenic is very useful in some cases, and the arsenical water of La Bourboule we have found particularly valuable, given night and morning in doses of four to eight tablespoonfuls with a little hot milk. Cod-liver oil is most useful in all strumous cases and in cases of defective nutrition. In summer change to the *seaside* and cautious bathing with sea-water greatly favours complete recovery, and in older children *mountain air* is often of very great service, promoting as it does a sort of pulmonary gymnastic, and leading to more complete expansion of the lung. It tends to favour the disappearance of residual deposits and to promote the re-expansion of collapsed portions of lung.

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* "System of Practical Medicine," vol. iii. p. 371.

Secondary pneumonias are apt to occur in the course of the acute fevers and in the last stage of many chronic diseases. These are not *true* pneumonias, but are either "hypostatic" and dependent on passive hyperæmia and collapse, or they are local inflammations, set up probably by the morbid infective state of the blood associated with the original disease.

There is little to be said with regard to their *treatment*, which must necessarily depend greatly on the nature of the disease of which they are complications. They are usually associated with a tendency to cardiac failure, and all those measures of active stimulation which we have described as appropriate to the final stages of the two forms of pneumonia already considered will ordinarily be applicable also here. At the onset of such congestive conditions, warm mustard and linseed poultices are often useful, or hot flannels sprinkled with turpentine.

Ether, ammonia, bark, strychnine, alcohol will be found useful in most cases, administered according to the directions already laid down. Digitalis may also be useful in some instances. But it would be unscientific to attempt to dictate the treatment of one of those secondary pneumonias, apart from that of the co-existing original disease.

Gangrene of the lung.—It happens but rarely that, as a result of pneumonia, a portion of the lung tissue sloughs, and this is evidenced by the expectoration of intensely fœtid sputum and the presence of a horribly fœtid odour of the breath. Gangrene may also occur from the lodgment of septic emboli in the lung, or from other septic or mechanical injury to it. The object of **treatment,** in such cases, in addition to supporting the patient's strength by suitable stimulants, food, and tonics, is to disinfect and deodorise the sputum and the respired air. The local use of disinfectants (vapours and sprays) and the internal administration of antiseptics, which may be eliminated at the pulmonary surface, are the remedial measures to be adopted. Nothing is so suitable as the continuous wearing of the open zinc respirator figured at page 499. The sponge in it should be kept saturated with eucalyptol, or creasote, or turpentine, or terebene, or a solution of carbolic acid with camphor or iodine in spirits of chloroform. The patient should also be made to inhale freely, from a steam spray-producer, a spray of a 2 to 5 per cent. solution of carbolic acid twice a day, so as to disinfect more completely the air-passages; oxygen inhalations have proved useful. The vapour of turpentine or eucalyptol should also be diffused freely through the patient's apartment. Internally capsules of creasote (1 to 3 minims) or turpentine (5 to 10 minims), or emulsions of these antiseptics in combination with quinine, strychnine, iron, and other tonics should be given several times a day. Surgical interference may in some cases be necessary.

ADDITIONAL FORMULÆ.

Digitalis and ipecacuanha mixture for pneumonia.

℞ Fol. digital. pulv., 12 grains.
Rad. ipecac. pulv., 12 grains.
Aquæ, 6 oz.
Make an infusion, and add
Aquæ laurocerasi, 1½ dram.
Syrupi mori, 1 oz.

M. f. mist. A tablespoonful every hour. (*Bamberger.*)

To lower pulse and temperature in same.

℞ Sodii salicyl., 1½ dram.
Syrupi simp., 5 drams.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful every hour. (*Bamberger.*)

To relieve palpitation in same.

℞ Morphinæ hydrochlor., 1½ grain.
Aquæ laurocerasi, 2½ drs.

M. f. sol. 5 to 10 drops every hour. (*Bamberger.*)

Chloral enema in same.

℞ Chloral hydrate, 30 to 40 grs.
Mucilag. acaciæ, 4½ oz.
Aquæ, 1½ oz.

M. f. enema. (*Bamberger.*)

Mixture for catarrhal pneumonia.

℞ Ammonii chloridi, 80 grains.
Syr. scillæ *vel* senegæ, 3 drs.
Liq. ammonii acet. ad 4 oz.

M. f. mist. A dessertspoonful in water every three hours. One or two drops of tincture of aconite may be added to each dose, carefully watching the effect.

Another.

℞ Ammonii carb., 48 grains.
Mucil. acaciæ, ½ oz.
Syrupi, ½ oz.
Tinct. lavand. comp., 2 drs.
Aquæ ad 4 oz.

M. f. mist. One teaspoonful in water every two or three hours for a child three years old. (*Pepper.*)

Another if respiratory failure threatens.

℞ Quininæ sulph., 24 grains.
Strychninæ, ¼ grain.
Acid. hydroch. dil., 15 mins.
Glycerine, 3 drams.
Liq. pepsinæ ad 4 oz.

M. f. mist. A teaspoonful in water every three or four hours for a child five years of age. (*Pepper.*)

Mixture for the relief of cardiac failure, cough, and dyspnœa in pneumonia.

℞ Spirit. ammon. arom., 1½ oz.
Spirit. ætheris sulph., 1 oz.
Tinct. digitalis, 2½ drams.
Moschi, 1 dram.
Vini ipecacuanhæ, 6 drams.
Tincturæ cinchonæ ad 6 oz.

M. f. mist. A tablespoonful in a wineglassful of water every four hours. (*Whitla.*)

Powders in catarrhal pneumonia.

℞ Hydrargyri subchloridi, 1 gr.
Sodii bicarb., 24 grains.

M. et div. in pulv. 12. One or two every three hours, until the bowels are moved once or twice.

Another formula.

℞ Hydrargyri subchlor., 1 gr.
Pulv. ipecac. comp., 10 grs.

M. et div. in pulv. 12. One every three or four hours. (*Pepper.*)

CHAPTER VI.

THE TREATMENT OF PLEURISIES.

Classification of Pleurisies according to their Causation, Course, and Results.

Simple Dry Pleurisies—Symptoms—Latent Apical Pleurisies—Their Recognition and Significance—Treatment of Dry Pleurisies.

Pleurisies with *Sero-fibrinous Effusion.* (*a*) *Treatment* of Cases with *Small* Effusions—Leeches—Opium—Counter-irritation—Cold Applications—Aperients—Diuretics—Antipyretics. (*b*) *Treatment* of *Moderately Large* Effusions—Counter-irritation—Mercurial Inunctions—Limitation of Fluids—Change of Air in Chronic Cases—Milk Diet—Diuretics, etc. (*c*) *Treatment* of *Large* Effusions—Physical Signs—Pilocarpine—*Thoracentesis*—Dangers of Delay—Indications for Operation—Puncture with *Aspiration*—Apparatus—Method of Operating—*Precautions* necessary—Accidents and Dangers.

Pleurisies with *Purulent* Exudation—*Empyemata*—Etiology—Bacterial Influence—Diagnosis—Value of Exploratory Puncture—Modes of Termination—Possibility of Spontaneous Absorption—Operative Measures—Aspiration—Pleurotomy—Simple Incision—Resection of Rib—Drainage—Irrigation—Antiseptic Dressings—Thoracoplasty. Additional Formulæ.

THE therapeutics of inflammations of the pleura are not greatly dependent on etiological considerations; they are more directly concerned with considerations of the severity and course of each particular case. Still, it is necessary to examine briefly the classification of pleurisies, both etiological and clinical.

Pleurisies have been divided into *primary* and *secondary*.

Primary acute pleuritis has generally, hitherto, been referred to *chill*, and has been looked upon as related to rheumatic inflammations. But it has been suggested that "catching cold" does not explain the origin of these cases without the co-operation of some other agency. Cold, it is urged, only prepares the soil for *microbic* infection, and the microbes themselves may reach the pleura, through lymphatic channels starting, for example, from the tonsils. But this, at present, is only speculation, while there can be no doubt of the occurrence of attacks of acute pleuritis after exposure to chill.

Secondary pleurisies may be excited by a variety of causes. They may be *traumatic*, and produced by wounds, contusions, or other injuries of the wall of the chest; they may accompany *diseases of the lungs*, *pericardium*, and *mediastinum*, inflammatory or malignant; they may be due to *morbid states of the blood*, *constitutional* or *infective*, as in *septic* and *uræmic* states, and in the *tubercular*, *rheumatic*, and *syphilitic* constitution. Pleurisies may also be classified according to their *course* and *results*. They may be *acute*, *sub-acute*, *chronic*, and *latent*, and the *result* may be an *adhesive* exudation (*dry* pleurisy), causing adhesion of opposed surfaces, or a *sero-fibrinous*, *sero-purulent*, or *hæmorrhagic* fluid exudation (pleurisy with effusion), which may accumulate in the pleural cavity, and vary in amount to almost any extent.

The chief considerations which affect the **treatment** of pleurisies are (1) whether they are *primary* or *secondary*; (2) whether they are attended with *fluid* or *adhesive* exudation (*i.e.* with or without effusion); (3) whether the effusion is *sero-fibrinous* or *sero-purulent*; and (4) whether the effusion is *small*, *moderate*, or *large* in amount.

First, with regard to **simple dry pleurisies.** In these cases there is merely inflammatory thickening of the pleura—due to proliferation of its normal connective tissue—and adhesion of its opposed surfaces as the usual result.

Some forms of dry pleurisy are almost completely *latent*, so that dry pleurisy has been said to have "no symptoms," and adhesions of the entire pleural surface have been found *post mortem* in the bodies of persons who never have been seriously ill.

Attacks of *dry pleurisy* affecting the *apex* and upper part of the lung—*i.e.* those parts of the chest which are almost motionless in ordinary tranquil breathing—are much more likely to be "latent"—to pass unobserved—than similar attacks involving the lower and more movable parts of the chest.

Scanty fibrinous exudations in the latter situation are commonly attended with the following symptoms: *sharp pains*, or stitch in the side, on inspiration, or on coughing or sneezing; *tenderness* on pressure over certain ribs or intercostal spaces; *shallow*, cautious inspiration, the body being usually inclined towards the side affected; *cough* may be present or absent; a *friction* sound, or "pleuritic rub," can be heard on examination of the affected side of the chest.

We have had occasion to observe that **latent** adhesive pleuritis in the region of the **apices** of the lungs, apart from tubercular cases, plays a more important part in the causation of some chronic forms of chest affections than is generally recognised.*

The **treatment** of ordinary uncomplicated cases of **dry pleurisy,** affecting the *lower* part of the chest and attended by the symptoms mentioned, is simple.

If the *pain*, "the stitch," is very severe, and if the temperature is raised two or three degrees, as is frequently the case, a few leeches applied to the seat of pain, followed by a hot linseed poultice or a hot compress, is usually very efficacious in giving relief.

Some German physicians advocate the local application of cold (cloths wrung out in ice-cold water) in such cases, but this method is repugnant to many patients, and should the pleuritis have a rheumatic origin it might prove injurious. Limiting the movements of the ribs, etc., in breathing by the firm application of a flannel roller, or a broad band of adhesive plaster, around the base of the chest is valuable.

A few small doses of opium in combination with mild salines has an excellent soothing and anodyne effect in these cases of severe pleuritic pain. The following is a good formula :—

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* See the author's paper on "Pleurisy of the Apex," *British Medical Journal*, November 24, 1877.

℞ Pulv. ipecac. comp.	5 grains.
Potassii citratis	20 ,,
Liq. ammonii acet.	2 drams.
Aquæ camphoræ	ad 1 oz.

To be taken every three or four hours until the pain is relieved. In rheumatic cases it may be serviceable to add 10 grains of **salicine** or **sodium salicylate** to each dose.

The bowels should in all cases be kept freely relieved by means of 1 or 2 drams of sodium sulphate dissolved in 1 or 2 ounces of warm water the first thing every morning. If the tongue is thickly coated and the urine high-coloured, it will be advisable to give also at night a grain of calomel with 4 grains of colocynth and henbane pill. After the acute pain has disappeared, and if friction sounds are still heard, small flying blisters over the seat of the friction or repeated applications of iodine paint are of use. Some physicians recommend the *immediate* application of a blister, but we do not think this is desirable, as most of these cases of dry pleurisy get quickly well with the simple measures here described. The patient should be, of course, confined to his room, and if there is fever present, to his bed.

The **treatment** of pleurisies with more or less **sero-fibrinous effusion** must be to some extent determined by the amount of the effusion and the interference to function produced by it.

The amount of effusion in these cases will vary from a few ounces—just enough to give rise to three or four finger-breadths of dulness at the base of the chest—to several pounds, filling up the whole of one side of the chest, compressing and flattening the lung completely, displacing adjacent organs, and causing serious dyspnœa from interference with the respiratory and circulatory functions.

The treatment appropriate to these varying conditions must also vary. We propose to consider :—

1st, the treatment of cases with *small* effusions;
2nd, those with *moderate* effusions; and
3rd, those with *large* effusions.

The treatment of cases of acute pleuritis with only a **small** amount of fluid effusion, giving rise to three or four finger-breadths of dulness at the base of one lung, may be conducted on much the same plan as that of acute dry pleurisies.

At the onset of the attack we shall usually find more or less fever, a temperature of 102° to 103°, and more or less pain in the side; and the indication for treatment is to relieve these symptoms and to *diminish the intensity of the pleural engorgement*, and so prevent the further effusion of fluid or promote the absorption of that already effused. Severe *pain* in the side must be met by the application of six or eight leeches, followed by a hot linseed poultice, and this succeeded by a flannel bandage applied tightly round the chest, so as to limit the respiratory movements. If the pain still continues, flannels or spongio-piline wrung out in hot water, and freely sprinkled with laudanum or opium and belladonna liniment, will be useful. Repeated moderate doses of opium, internally, should also be given to allay the distress of breathing, to calm the patient, and to produce a subjective condition favourable to recovery. There is no doubt, also, that opium exercises a controlling effect over the capillary circulation in the inflamed serous membrane, and so tends to moderate the inflammatory changes. When there is much fever, it may be advantageously combined with *salicin* or *sodium salicylate* and a saline diaphoretic, especially in rheumatic cases—

℞ Extr. opii liquidi	10 minims.
Salicinæ (*vel* sodii salicyl.)	10 grains.
Potassii citratis	20 ,,
Liq. ammonii acetatis...	3 drams.
Aquæ	ad 1 oz.

M. f. haust. To be taken every three hours until the pain is relieved.

It is desirable at the same time to obtain one or two loose actions of the bowels daily, and this may be secured by giving the aperient pill and the sodium sulphate, as already described. The opium should be discontinued as soon as the pain is relieved. If there is much irritative cough, it may be allayed by giving the patient a morphia and ipecacuanha lozenge to suck from time to time. As soon as the fever has subsided —which will usually be in from two to seven days— counter-irritation should be applied over the seat of the effusion.

The best form of counter-irritation is the "*flying" blister ; i.e.* instead of one large blister kept on for several hours over the same spot, repeated small blisters not bigger than the palm of one's hand are applied in succession to different, but adjacent, parts of the chest over the area of dulness, and kept on from two to four hours, according to the effect produced, which will vary with different patients. By the use of small blisters, retained for only a short time, we avoid any extensive vesication, as well as any renal or vesical irritation in persons prone to cantharidism, and we are enabled to re-apply them, after a short time, over the same spot.

By blistering and by *dry-cupping*, which some employ, we obtain a powerful derivation to the skin, for they both act by dilating the vessels of the skin, and so we diminish the over-distension of the vessels of the pleura.

The local application of iodine is a valuable measure, and acts similarly to a blister, and is more convenient in small effusions tending to become chronic.

Of course, while there is any fever the patient must be confined to bed, and kept on a light diet, the chief constituents of which should be milk, gruel, beef-tea, light clear soups and broths, and eggs beaten up with milk.

The use of **diuretics** to promote the absorption of the fluid effused has been advocated by some, but little reliance is to be placed on them. Potassium iodide has, however, been found of value for this purpose in cases of rheumatic origin.

By measures such as these most cases of primary pleurisy with small effusion in healthy persons will soon be cured.

It will be seen that we have said nothing of the use of *bleeding*, or of *tartar emetic*, or of *mercury* in the treatment of acute pleuritis, and it is because we do not consider they have any place in the *rational* treatment of this disease.

The exhibition of *antipyretics*, such as antipyrin, antifebrin, salol, and phenacetin in the acute febrile stage has been warmly advocated by Dr. Matas.* We think they are rarely needed, but if the temperature is unusually high we see no objection to a few 3- or 4-grain doses of *phenacetin* given in combination with 2 or 3 grains of *hydrobromate of quinine* every two or three hours. We should not continue the phenacetin after the temperature has been reduced. The importance of allaying *cough*, which aggravates the *pain* of the acute stage so greatly, has been dwelt upon by most writers; *opium* is, as we have said, the best remedy for this purpose, and if a very rapid action is desired, a hypodermic injection of morphine ($\frac{1}{4}$ grain) and atropine ($\frac{1}{100}$ grain) may be given. "In opium," says a writer we have already quoted,† "we find an agent which not only acts in a *direct manner* on the pleuritic process *in loco*, but also by its relief of the symptomatic phenomena—pain, cough, and dyspnœa—through its influence on the sensory apparatus, ensures a degree of local physiological rest to the inflamed organ, which is of infinitely greater benefit than that which is obtained by mechanical restraints."

The constipating effect of opiates should be anticipated by the administration of an initial dose of

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* Hare's "System of Practical Therapeutics," vol. ii. p. 629.

† Dr. Matas, Hare's "System of Practical Therapeutics," vol. ii. p. 627.

2 or 3 grains of calomel, followed by a saline aperient; by thus getting rid at starting of all accumulations in the alimentary canal, we shall have less hesitation in giving opium freely to relieve pain and cough, and aperients should be repeated when required, but we see no good reason for disturbing the patient by frequent purges.

A dose of chloral with potassium bromide may occasionally be needed to procure sleep. Tonics of quinine or bark, together with strychnine or iron, will be useful during convalescence.

We have next to consider the treatment of cases with **moderately large** effusion, with percussion dulness, extending up to, or a little above, the angle of the scapula.

The same plan and principles of treatment which have just been sketched apply equally to these cases, except that counter-irritation will probably require to be more vigorously carried out and continued longer; and if the effusion lingers long, and shows signs of increasing rather than diminishing, and is uninfluenced by this treatment, and especially if the patient begins to suffer from dyspnœa on slight exertion, or his general health appears to suffer, then, even in the case of moderate effusions, we may wisely have recourse to *paracentesis* for the withdrawal of the fluid, or a portion of it; for it is not uncommon to find the withdrawal of even a small quantity of fluid from the pleural cavity to be followed by rapid absorption of the remainder.

We should, however, be in no haste, in these cases of moderate effusion, to advise paracentesis. Well-directed and repeated counter-irritation, sometimes in the form of flying blisters, sometimes in the form of iodine paint, and sometimes, as suggested by Niemeyer, the rubbing into the chest of half a dram of mercurial ointment* twice daily, until some slight effect on the gums is produced, will promote the removal of the effusion, and avoid any necessity for an operation, which some sensitive patients dread.

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* Fraentzel also advises mercurial inunctions: Ziemssen's "Cyclopædia," vol. iv. p. 686.

The disappearance of some of these moderate effusions may be promoted by a strict limitation of the amount of fluid consumed: only just sufficient liquid being allowed the patient to prevent his suffering from thirst.

It will not infrequently happen that after a certain amount of the effusion has disappeared the remainder will linger unabsorbed and uninfluenced by any of our remedies; in such cases it is often of great service to prescribe *change of air*, especially when the season of the year is favourable. Removal to the seaside will in some cases be attended with immediate improvement, or, still better, change to a Swiss *Alpine* resort, where, in addition to the tonic effects of fresh, pure, bracing air, a certain amount of lung gymnastic is induced, will promote the absorption of the lingering exudation and the re-expansion of the lung.

Pleural effusions have been reported as rapidly disappearing under the diuretic influence of *caffeine* combined with sodium benzoate, about 40 grains of each, in twenty-four hours, associated with a milk diet. Large doses of *antipyrin*, 90 grains a day, 15 grains every four hours, have been credited by Clement, of Lyons, with the power of rapidly causing the absorption of pleuritic exudation. The administration of drastic, hydragogue cathartics, like *elaterium*, we only mention in order to condemn.

Intercostal massage of the affected side, as practised by Cimbali, of Siena, for the removal of lingering exudation, may be regarded as a passing fashion, suggested by the modern craze for mechanical treatment.

In the next place, we must consider the treatment of pleurisies with a **large** amount of *sero-fibrinous* effusion.

The co-existence of the following physical signs may be regarded as indicative of the presence of a *large* effusion in the pleural cavity:—(1) Visible and *measurable* distension, with immobility of the affected side of the chest. (2) Absolute dulness on percussion over a great extent of surface, front as well as back. (3) Absence of vocal fremitus over the dull area, as well as a sense of fulness and absence of elasticity conveyed to the hand placed on the chest. (4) Entire absence of respiratory murmur on auscultation over the greater part of the affected side. (5) Considerable displacement of adjacent organs, of the heart to the right or left, of the liver downwards on the right side, and the spleen on the left.

It must, however, be borne in mind that a very considerable effusion may exist without the co-existence of all these physical signs, and we must, therefore, attend to such evidences as may be furnished by other symptoms, such as great dyspnœa on making even slight movements, cyanosis, evidence of cardiac feebleness, and distension of the right side of the heart—as a small irregular pulse, palpitation on any exertion, scanty, high-coloured urine, etc.

We must also bear in mind that the largest effusions are often found in cases in which the symptoms develop slowly and in an almost imperceptible manner.

In the management of *large* effusions during the early febrile stage the same measures may be adopted as we have described as applicable to the treatment of small and moderate effusions, and if we see any signs of diminution in the amount of the fluid effused, we may persevere with these measures, and wait patiently for a further subsidence of the exudation. There is no occasion for alarm or hurry so long as no serious signs of circulatory or respiratory failure make their appearance, and no great amount of cardiac displacement is detectable. But if after the febrile stage has passed away, and at the end of the second or third week of the illness, there still remain the evidences of a large effusion which shows no sign of diminution, it will be rarely advisable to waste time in further medicinal treatment. The hypodermic injection of $\frac{1}{3}$ of a grain of *pilocarpine* has been advised in the treatment of these large effusions, the profuse diaphoresis and salivation thus produced having been found, in some instances, to favour the disappearance of the exudation. But it must be remembered that *pilocarpine* produces serious circulatory depression, and where there is no particular reason to fear the effects of puncture of the pleural cavity we should be disposed to prefer it. While we are by no means disposed to advocate hasty or early resort to *paracentesis thoracis*, especially in cases in which there appears to be a reasonable chance of removal of the effusion by absorption, we are nevertheless averse from unnecessary waste of time in the application of inefficient measures for the removal of a large effusion, attended with serious respiratory trouble, or of long duration, which shows no signs of disappearing. The inconveniences and dangers accompanying such delay are not imaginary, while the operation of puncture with or without aspiration, performed with the precautions and care we shall immediately insist upon, is one of the simplest and safest possible. No doubt the operation when first introduced, and when performed with insufficient care, caution, and skill, was not infrequently attended with certain drawbacks and dangers, but these are rarely heard of now.

Delay in the removal of some portion of an extensive effusion may be attended by serious results. Not only does it lead to over-distension and enfeeblement of the right side of the heart and hyperæmia of the opposite lung, not only is there some risk by unreasonable delay that the compressed lung may become bound down by firm bands of lymph, or become the seat of fibroid changes, and so be prevented from re-expansion, but the danger of sudden death from displacement of the heart when the effusion is large and situated on the *left* side must be borne in mind.*

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* A striking instance of this is mentioned by Dujardin-Beaumetz, the delay in aspiration having been caused by the apparatus not being in order. ("Clinique Thérapeutique," vol. ii. p. 713.)

As we have already said, we should not be in haste to puncture *recent* effusion even if extensive, although early puncture in the febrile stage has had many advocates, and even so careful an observer as Potain has seen no objection to thoracentesis as early as the second or third day; but we do not consider this operation justified during the febrile period, unless the effusion is so large and the interference with respiration and circulation so great as to endanger life; then, of course, there should be no hesitation, and the pleural cavity should be at once punctured, and a certain amount of the effusion withdrawn.

We may conclude, then, that **thoracentesis** is indicated whether in the *acute* or *chronic* stage, whenever the effusion is so large as to interfere seriously with the functions of respiration and circulation. It is also indicated when the effusion is considerable and shows no tendency to diminution with other methods of treatment; and it is also indicated when the effusion has existed so long that there is danger of the lung remaining permanently compressed and inexpansible unless the pressure upon it be removed. The existence of effusion into both pleural cavities may also point to the need of withdrawing a portion of the fluid from one: an expedient which will often be followed by the absorption of the fluid in the other.

When we advocate *thoracentesis* for the relief of pleuritic effusion, we refer to the combination of *aspiration* with *puncture*, as is now usually practised.

The apparatus necessary for this operation is quite simple. We need (1) a small *trocar* or a hollow sharp-pointed quill-shaped needle, for piercing the chest; (2) an exhausted receiver—any ordinary bottle or flask will do; (3) an exhausting syringe or pump; and (4) air-tight tubes connecting these. The use of hollow sharp-pointed needles is very common in England, but we consider the objection made to them a valid one—viz. that there is a danger, as the lung expands at each inspiration, of its surface becoming wounded or irritated by contact with the pointed end of the needle.

The most suitable and convenient form of apparatus for the purpose of thoracentesis is that known as Potain's. The accompanying drawing (Fig. 19) shows the apparatus in use, and needs little explanation :—

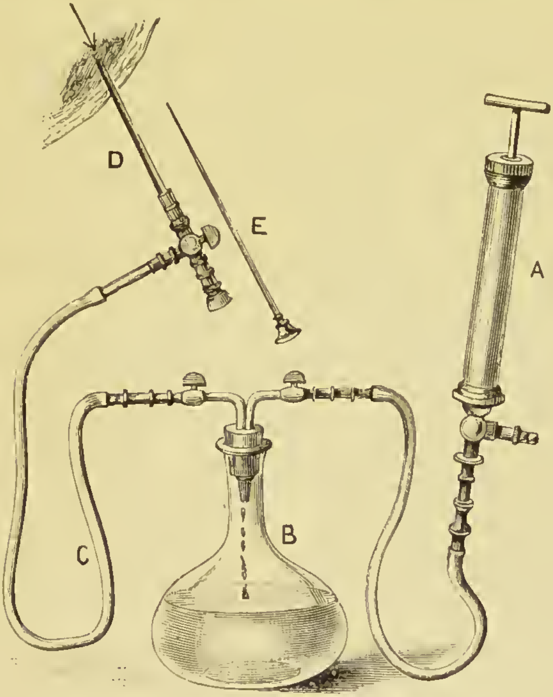

Fig. 19.—Potain's Apparatus for Thoracentesis.

B is an ordinary bottle or flask, in which a vacuum is made by the exhausting syringe A. C is a tube connecting the exhausted receiver with the trocar, which is used for piercing the chest wall, and E is the stylet withdrawn from the cannula D, which can be re-introduced should the latter become obstructed during the exit of the effusion.

The trocar and needles vary in size. We prefer the *smaller* ones, as we greatly object to the *rapid* evacuation of the fluid, which the larger instruments encourage, and which was, we believe, together with want of sufficient cleanliness, the cause of most of the dangers which have been described as attending this operation. With a *small* trocar the operation is less painful and less dreaded by the patient. All that can be said in favour of the large hollow needles, which we have often seen used, is that they save the time of the operator—an unworthy consideration, which should never be allowed to weigh with us—and are less likely to be obstructed with fragments of lymph floating in the pleural effusion. But in Potain's apparatus the cannula can readily be cleared by the reintroduction of the stylet. We have seen the large needles also become blocked, and in that case a fresh puncture has to be made. A trocar with a diameter of $\frac{1}{20}$th of an inch is large enough.

It is of extreme importance to examine every part of the apparatus before using it—to test the stopcocks, and to see that the tubes and needles are quite clear. It is also of the very greatest consequence that every portion of the apparatus, and especially the trocar and cannula, should be perfectly *aseptic*. It was undoubtedly owing to a disregard of antiseptic precautions, that to puncture and aspiration was formerly frequently attributed the conversion of a serous into a purulent effusion.

The puncturing part of the apparatus, whether needle or trocar, should be washed with a 10 per cent. solution of carbolic, and afterwards dipped in alcohol and passed through the flame of a spirit-lamp, and some warm 5 per cent. solution should be aspirated through the tubing attached to the trocar.

The part of the chest selected for puncture should be cleansed with soap and water, and finally wiped with cotton-wool soaked in an alcoholic solution of carbolic acid.

As to the best place to make the puncture, opinions differ somewhat, but there is a certain consensus of opinion in favour of the axillary region, and the particular intercostal place selected must depend on the amount of the effusion; on the right side the fifth or sixth interspace, and on the left side the sixth or seventh may, as a rule, be safely chosen. We are accustomed to introduce the trocar about *an inch in front of the posterior axillary line* and into the intercostal space which lies just below the angle of the scapula, when the arm is advanced and drawn across the chest, as it should be for this operation.

This situation has these advantages :—

(*a*) It is easily found.

(*b*) The patient is able to assume a comfortable position, and one convenient to the operator—*i.e.* raised in bed on pillows, with the arms crossed on the chest.

(*c*) The patient does not see the puncture.

(*d*) If we go nearer the spine the intercostal spaces become too narrow, and the wall of the chest is thicker and more difficult to pierce through, and the position is not so convenient to the patient or the operator.

(*e*) You run no risk of wounding any important organ.

You must feel for the depression of the intercostal space with the point of the left index finger. This is somewhat difficult with stout patients. Then, supporting the trocar, which should be previously dipped in carbolic oil and be grasped firmly by the right hand, against the left index, you thrust it quickly and firmly through the intercostal space into the pleural cavity, taking care to avoid the situation of the intercostal vessels and nerves which lie under the lower border of the rib above. The skin, if it should appear to be very thick and tough, may be divided by a slight cut of a knife, but this is rarely necessary when using a small trocar. In sensitive patients it is advisable to anæsthetise the skin before puncturing, and this is best done by the hypodermic injection into the subcutaneous tissue of a few drops of a 5 or 10 per cent. solution of cocaine hydrochlorate. If the trocar should unfortunately come against a rib, it must be partially or wholly withdrawn, and re-introduced.

It is a good plan to tell the patient to take a deep inspiration and hold his breath for an instant when you are about to puncture. The intercostal spaces are thus expanded.

After the introduction of the trocar the stylet is withdrawn and the tap of the trocar closed. At the same time you open the tap connected with the exhausted bottle, and the liquid flows into it from the pleural cavity.

It will sometimes happen that the cannula or needle becomes blocked by a plug of false membrane, which has been sucked into it from the pleural cavity, and which prevents the flow of fluid through the tube. To remove this, the trocar is again passed through the cannula, or when a needle is used, a blunt-pointed plunger, which is connected with some needles, is passed through the tube of the needle to clear it.

Some think there is danger in doing this of introducing air into the pleural cavity, and prefer to make a fresh puncture; but it must be remembered that, trifling as the operation of puncturing the chest may seem to the operator, the patients themselves particularly object to it, and there is always a tendency in the patient's mind to believe there has been some bungling on the part of the operator if the puncture has to be repeated; and if care be taken to have a closely-fitting plunger or trocar, well oiled with carbolic oil, and if the apparatus is really well made, there ought not to be any danger on re-introducing the trocar of admitting air into the pleural cavity.

It is not necessary, nor is it usually advisable, to withdraw as much fluid as you can from the pleural sac. Indeed, it is rarely desirable to withdraw more than 30 to 60 oz. at one aspiration. For it has been often observed that when aspiration has been carried to a greater extent than this, the patient, on returning to the horizontal position, has been seized with most violent and persistent attacks of cough of the most distressing kind. This is all the more likely to occur if the fluid has been withdrawn rapidly. If it is wished, for any reason, to remove a considerable quantity of fluid at one aspiration, it should be done very slowly and with interruptions, so as to allow of a *gradual* return of the compressed lung to the altered physical conditions.

We have always been in the habit of terminating the aspiration at once if, after the withdrawal of a certain amount of liquid, the patient begins to have a troublesome cough* or to complain of severe pains within the chest. It is certainly most undesirable to remove a large quantity of fluid *very rapidly*, so as to expose the previously compressed and displaced viscera to suddenly altered physical conditions; by using a fine trocar, and by occasionally interrupting the outflow by compressing the tube connected with the pleura, we avoid a too sudden disturbance of the pre-existing physical conditions within the chest. It has also been observed that profuse *expectoration of albuminous fluid* sometimes follows a too rapid removal of a large mass of fluid from the pleural sac, and this has been shown to be due to sudden congestion of the previously compressed lung, the vessels of which may well have lost some of their tone, and natural physical properties, after long compression, so that on the sudden re-entrance of blood into them some of its albuminous constituents are allowed to escape through the vascular walls.

In certain rare cases of sudden death after aspiration, this has been thought to be caused by sudden cerebral, and especially *bulbar*, anæmia, due to the afflux of blood to the hitherto compressed lung. It is a good plan to give the patient a little brandy and water before the operation, and to repeat the dose, or, if necessary, give some ether and ammonia during the operation, especially if any feeling of faintness is complained of.

Having withdrawn the necessary quantity of fluid, the cannula or needle should be removed gently, compressing the skin around it with the fingers as you do so, so that no air shall enter the chest, and then a pledget of lint, dipped in collodion, should be at once applied over the puncture, which should be covered with another fold of lint fixed with a strip or two of adhesive plaster; a flannel bandage should then be applied tightly round the chest.

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* The use of a manometer to indicate the amount of intrapleural tension is an unnecessary complication of the operation; and we agree with Schreiber that "the physiological phenomena which promptly indicate the existence of dangerous tension-reduction are even safer indices than the manometer."

We have been accustomed to apply, after aspiration, a broad piece of adhesive plaster very firmly round the affected side, so as to restrain as much as possible the respiratory movements of the chest wall and to keep the lung at rest, and we have thought this has been useful in preventing any unpleasant effects after the operation.

Having removed a portion of the effusion by aspiration, not infrequently the remainder is absorbed; or the level of the fluid in the pleura may remain stationary; and in order to promote its absorption, we may have to employ counter-irritants in the manner already described in speaking of the treatment of moderate and small effusions.

Or the fluid may slowly re-accumulate and necessitate another aspiration. But if the fluid re-accumulates rapidly, it must be borne in mind that its re-accumulation may be due to the fact that the compressed lung is bound down by permanent bands of false membrane, and cannot expand when the fluid is withdrawn. In that case, to continue withdrawing the fluid by aspiration would simply exhaust the patient, as we should be repeatedly draining off the serum of the blood into the pleural cavity.

It is advisable, before resorting to aspiration, to make sure that the diagnosis is correct, as well as to ascertain, with certainty, the nature of the exudation we have to deal with. For this purpose an exploring puncture should be made with a hypodermic syringe, provided with a rather long and stout needle. After carefully cleansing it with carbolic solution, the needle should be introduced into the chest, below the level of dulness, and then if the piston of the syringe be drawn up, the barrel of the syringe will become filled with fluid, and you can then see whether it is serous, or purulent, or hæmorrhagic. The working of the syringe must be tested beforehand, or the test may fail simply from the defective condition of the syringe.

If after aspiration the patient is troubled with cough, small doses of morphine—$\frac{1}{24}$th of a grain—in half an ounce of chloroform water, should be given every hour or two until the symptom is relieved. Warm milk and seltzer or apollinaris water, with a little brandy or whisky, every few hours, will also contribute to relieve this cough, which is probably often due to the presence of a little adhesive tenacious mucus in the long compressed bronchi.

Much was written formerly about the *dangers* attending the operation of thoracentesis. We have already alluded to one of these: viz. the occurrence of "*albuminous expectoration.*" This occasionally assumed serious proportions, and was due to intense congestion of the previously compressed lung. This accident was undoubtedly caused by the too rapid withdrawal of too great an amount of fluid; and, as has been urged by Dieulafoy and other experienced physicians, it is of the greatest importance not to withdraw large amounts of fluid at one sitting, especially in old cases where the lung has been long compressed.

Other dangers or accidents cited by authors are: wounding the intercostal vessels, injury to the rib, puncture of adjacent viscera, liver, spleen, and heart, failure to withdraw fluid from plugging of needle, admission of air and conversion of a serous effusion into a purulent one, production of serious paroxysms of cough and severe intrathoracic pain; all these dangers and accidents may be avoided, as we have shown, by caution and care in the performance of the operation and proper attention to the fitness of the instruments employed. Dr. Matas testifies—and our own experience entirely agrees with his testimony—

"that in a practice of over ten years' duration in the wards of the New Orleans Charity Hospital—an institution which annually ministers to the ills of over 20,000 patients—and in which the puncture and aspiration of the pleura was probably performed over one hundred times a year," he had "never witnessed or heard of a fatal accident occurring during its performance."* With regard to the occurrence of sudden death during aspiration, the same author remarks : "The rigorous analysis of the facts, and the special study of the individual cases by such conscientious investigators as Leichtenstein, Bowditch, Toussain, Dieulafoy, and Donaldson, have proved conclusively that these unfortunate results were not attributable to the operation itself, but to the conditions under which it was practised."

The *treatment of* **purulent effusions** must next occupy our attention.

This form of pleuritis is far more common in childhood than in adult life. It often occurs then as a complication of broncho-pneumonic attacks, or in association with measles or scarlet-fever, or other infective maladies. It also occurs sometimes in the puerperal state, and is not rarely dependent on pulmonary tuberculosis. It may have a more or less obvious local origin, as from abscess in the chest wall, due to disease of bone opening into the pleural cavity; or the same may happen with a hepatic abscess or a hydatid cyst; or it may be associated with intrathoracic cancer. It would seem at times as though merely a low, depressed state of the general health determined the purulent transformation of a pleuritic exudation, so that it may result in this way from a primarily sero-fibrinous effusion.

It has been maintained that *primary* purulent pleuritis is *extremely rare*, and that, in almost every case, the effusion is at first sero-fibrinous, and becomes, for some reason or other, subsequently purulent.

Modern bacteriological research traces the origin of

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* Hare's "System of Practical Therapeutics," vol. ii. p. 649.

purulent pleural exudation to the influence of *pyogenic* micro-organisms. The sero-fibrinous exudations, it is said, are the result of the action of non-pyogenic morbific micro-organisms, whereas the *sero-purulent* exudations are determined by the presence of *pyogenic* bacteria; or both kinds may be present, giving rise to a *mixed* infection.

Purulent pleuritis may, we are also taught, vary in its characters and tendencies, and, therefore, in the therapeutic measures most suitable for its relief, according to the particular variety of pyogenic microbe associated with its origin.

The most amenable to treatment are those—and they are the great majority—caused by the *Pneumococci* (*diplococcus pneumonicus*); they are usually connected with attacks of pneumonia, and are most frequent in the pleuritic effusions of childhood. This micro-organism is comparatively benign in its tendencies, and simple *aspiration* is often sufficient to effect a cure of the empyemata caused by it. The physical characters of this exudation are the following: it is *fibrino*-purulent, and has a large quantity of fibrin in suspension in the form of flakes or false membranes; it has a slightly greenish tinge, is odourless, and is more fluid than ordinary pus.

The *streptococcus pyogenes* appears to be the most common cause of empyemata in adults. These have a progressively destructive tendency; they are never spontaneously absorbed, but must be treated by free incision and drainage, with strict antiseptic precautions. This form of pus is found in the empyemata which are associated with infective diseases, scarlet-fever, measles, pyæmia, etc., or which follow the puncture of sero-fibrinous effusions with instruments that are not aseptic. It is usually of a greenish creamy aspect, thicker than the preceding, and may be darkened almost to a chocolate colour by an admixture of red blood corpuscles. Then there are the *putrid* and *gangrenous* varieties, due to the presence of *saprophytic* organisms, and easily recognised by their odour and aspect; these forms require not only aseptic *pleurotomy*, but also *antiseptic irrigations.*

Finally, there is the *tubercular* variety, characterised by the presence of Koch's bacillus. This form of pus is not easily identified, especially as it may also contain pyogenic micro-organisms, and a search for the *tubercle bacillus* is more often unsuccessful than successful.

Are there any signs or symptoms by which we can determine that a pleuritic exudation is purulent?

The physical signs are the same as when the effusion is sero-fibrinous, but it is commonly stated as a mark of distinction that in cases of empyema there is *œdema* of the wall of the chest; this, however, is certainly as often absent as present in such cases. Greater intensity and longer duration of *pain* are also said to distinguish purulent and tubercular from serous effusions.

Better and more reliable evidence is the continuance of fever, which assumes a hectic type. When the subject of an effusion into one or other pleural cavity continues to present the symptoms of a certain type of fever;—a temperature, with considerable diurnal fluctuations, rising in the evening and falling towards the morning, together with occasional shiverings and sweatings, a hectic flush on the cheeks, or an unhealthy muddy complexion, with loss of appetite, emaciation, etc., in such a case we may justly suspect that the effusion is purulent. If any doubt remains in our minds as to the nature of the effusion, it can be readily removed by a simple exploratory puncture by means of a hypodermic syringe, as already explained.

This simple and almost painless means of establishing our diagnosis should always be employed.

It is as well to make the exploratory puncture, unless there should be any reason to the contrary, in the same spot as will be afterwards selected for the radical operation should this be ultimately required.

Before we consider the best means of dealing with such an effusion, it may be as well to inquire what happens when such an effusion is left to itself.

In the first place, it may cause necrosis of a small portion or spot of the pulmonary pleura, and so lead to a communication between the pus in the pleura and the air-passages, through which the pus may from time to time be discharged in large or small quantities.

In such a case a fit of coughing will sometimes be accompanied by a profuse discharge of pus from the pleural cavity through the air-passages. If this pus has an offensive putrid odour, it shows that air has probably passed into the pleural cavity from the lung through the necrosed spot in the pulmonary pleura, and that a pyopneumothorax has become established. If the pus expectorated is sweet, it shows either that the opening into the lung is of such a nature that, although it admits of the passage of fluid from the pleura to the air-passages, it does not admit of the passage of air from the air-cells into the pleura, or that, as Sir J. Lister maintains, the *cilia* of the air-passages are able to prevent the entrance of putrefactive organisms into the deep portions of the lung.

It is possible for an empyema to become cured by such a mode of termination, but such an occurrence is extremely rare.

In the second place, the *pus* may, after necrosis of a portion of the *pleura costalis*, penetrate between the muscles of the thorax, and point externally, appearing under the skin as a tumour of variable size, usually near the sternum, about the fourth interspace, where the wall of the chest is thinnest. If this burst, the external opening is found usually to communicate by a fistulous tract, which may be three or four inches long, with the opening in the pleura. Through this opening pus will continue to discharge for years, and often gives rise to caries of the ribs. In either of these modes of discharge of an empyema a fatal termination may almost certainly be ultimately looked for, probably after many years of illness and suffering.

These are the cases in which we encounter such remarkable deformity of the chest and spine owing to slow and continued retraction of the walls of the pleural cavity.

There is, however, a third mode of termination certainly possible in very young subjects, and that is disappearance of the effusion by *absorption.* This has been occasionally observed in childhood, but it is a *rare* occurrence; indeed, it never occurs when streptococci, staphylococci, or tubercle bacilli are present in the morbid exudation, owing to the resistant vitality of the pyogenic bacteria.

What **treatment** should be adopted in dealing with these cases of purulent effusion into the pleural cavity?

In the case of young children, when the effusion is moderate in amount, and the general health is fairly well maintained, we must bear in mind the possibility of spontaneous cure by absorption, and not be in a hurry to adopt operative measures; especially if on examination of a portion of the pus withdrawn by exploratory puncture with a hypodermic syringe, we find that it is caused solely by the presence of pneumococci, and that there is an absence of pyogenic organisms.

If the empyema has communicated with the air-passages, and pus is being expectorated, and that pus is sweet, not offensive, it is well to wait for a time and see if there is any tendency to spontaneous cure, but if the general health is failing, or the expectoration is fœtid, it is best to operate.

What kind of operative procedure should be adopted?

In most recent cases, and especially in the cases of children, it is advisable to remove the pus once or oftener by aspiration. In several instances in the case of children aspiration has been followed by cure; sometimes even after a single aspiration, but more commonly after three or four.

Aspirate then first in all cases of young subjects, and if the effusion re-accumulates slowly, and is of thin and sero-purulent aspect, repeat the aspiration ; but if it re-accumulates rapidly, and is *thick*, it is best not to aspirate more than twice or thrice, but then to have recourse to free incision and drainage. There is a distinct advantage in aspirating, at least once, before having recourse to incision, for the pleural surfaces, which by this measure are brought into contact, may become adherent to some extent, and the adhesions thus formed between the pulmonary and costal pleura contribute to a favourable result after incision, as they leave a less extensive suppurating surface of pleural membrane.

In by far the great majority of cases of empyema it will be necessary to make a free opening, with strict antiseptic precautions, into the pleural cavity (pleurotomy), through which the pus may be discharged and free drainage of the pleural cavity maintained.

The next question that arises is, Where is it best to make that opening? And then another question : Is it best simply to make an incision through an intercostal space or to remove a portion of a rib?

Fraentzel recommends * that an incision 2½ to 3 inches in length should be made in the fourth or fifth intercostal space, midway between two ribs and parallel to them, commencing the incision somewhat external to the mammary line, and carrying it towards the axilla.

Dujardin-Beaumetz † advises making the incision in the fifth or sixth intercostal space in the axillary region and towards its posterior part, and directs it to be made along the upper border of the lower rib for about two inches.

The axillary region is a convenient one for this operation, as it involves no disturbance of the patient's position when sitting up in bed; it is also convenient for the introduction and removal of the drainage-tubes, and it is not pressed upon when the patient lies down, as an opening farther back would be.

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* Ziemssen's "Cyclopædia of Practical Medicine," vol. iv. p. 717.

† "Clinique Thérapeutique," vol. ii. p. 746.

If a portion of rib is excised, the sixth, seventh, eighth, or ninth, according to circumstances, may be selected in the mid-axillary line.

It is advisable to avoid making an opening too low down, as the diaphragm soon rises and comes into contact with the wall of the chest, and so might interfere with efficient drainage.

If, as occasionally happens, an accumulation should collect at the base, a subsequent incision may be made behind, in the tenth or eleventh interspace.

If a spontaneous opening has already been made by the pus working its way to the surface of the chest, it is advisable to make use of it, but if in the front of the chest time would probably be saved by making a counter-opening behind and passing a tube through.

The advantages gained by excising a portion of a rib are these—in the first place, you obviate an inconvenience that sometimes arises from simple incision when the intercostal spaces are narrow, for as the chest wall falls in they become still narrower, and you may find, after a time, that it is impossible to introduce a drainage-tube. Secondly, by excising a portion of a rib you are enabled to explore the pleural cavity by the finger, and sometimes dislodge large masses of curdy material, and secure efficient drainage throughout the progress of the case.

Simple incision is usually sufficient in children, and in some recent cases for adults, but in chronic cases, in which the lung is bound down by adhesions, and is not likely to expand readily, or where contraction of the chest has brought the ribs close together and narrowed the interspaces, or where preliminary aspiration shows the pus to be putrid, re-section of a portion of one or more ribs should be determined on.

But when the intercostal spaces are wide, and when the incision is made in the front of the chest, a simple incision in an intercostal space is usually adequate for the purpose.

Siphon-drainage by Potain's or Bülan's method has been advocated by many, the object being to secure constant drainage of the purulent exudation without incurring the risk of air contamination; but it has not been found so uniformly applicable or so generally successful as *antiseptic pleurotomy*, and we shall not occupy space by describing the method.*

In making a simple incision, perhaps the best situation to select is the eighth or ninth intercostal space on the left side, and the seventh or eighth on the right, just in front of the posterior axillary line; the skin in this region must be thoroughly cleansed and disinfected. The skin is best prepared by thoroughly washing with warm water and German green soap, then ether or alcohol is used to remove the fatty matter, and finally, a hot sterilised towel, steeped in 1 in 1,000 sublimate solution, is laid over the seat of operation.

The hands and nails of the operator should be scrupulously cleaned and brushed in the manner recommended for the patient's surface. The instruments should be dipped in a porcelain pan containing 5 per cent. carbolic solution. Treves advises chloroform as an anæsthetic, and in children it is practically impossible to operate without a general anæsthetic, but in certain cases in adults, where there is much exhaustion, and when simple incision is only intended, local anæsthetics may be safer. Dujardin-Beaumetz recommends the injection at each end of the line of the proposed incision of a few drops of a 50 per cent. solution of hydrochlorate of cocaine, so that the whole of the subcutaneous cellular tissue which is to be incised should be bathed for four or five minutes in the solution. "An incision from

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* Appreciations and details of this method will be found in an article by Bülan, *Zeitschrift für Klinische Medicin*, Dec., 1890; by Immerman, "Annual of the Universal Medical Sciences," vol. iii., 1888; and in Hare's "System of Practical Therapeutics," vol. ii. p. 665.

$1\frac{1}{2}$ to 3 inches in length is made transversely, so as to correspond to the upper border of the lower rib bounding the space. The intercostal muscles are divided close to the rib; a director is then gently thrust through into the pleural cavity; the opening made is subsequently enlarged with dressing forceps and the finger. The pus, if considerable, should be allowed to escape slowly. The abscess cavity may be examined with the forefinger as the fluid is escaping, or after it has been entirely evacuated. All thick curdy material within reach of the finger should be removed." * A *short* length of common drainage-tube, which should be large and not too stiff, should be introduced and kept in during the earlier days of after treatment. "Later, when the cavity is contracting, a bent rubber tube, like a soft tracheotomy cannula, answers the purpose." The drainage-tube must be *carefully secured* from slipping into the pleural cavity. For this purpose it may be provided with a shield like a tracheotomy-tube, or a tube folded upon itself and transfixed with a long safety-pin, as figured here (Fig. 20), has been found useful in children's cases; † the pin can be firmly fixed to the wall of the chest by a strip of adhesive plaster.

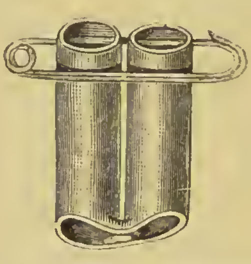

Fig. 20.—Cabot's Folded Drainage-tube for Empyema in Children.

After fixing the drainage-tube securely, the skin is cleansed, the wound is dusted with iodoform, and several layers of antiseptic gauze are applied. An oil silk or waterproof protection is placed over this, and the whole secured by a bandage. Frequent change of dressing (twice daily) will, at first, be needed. Should the pus discharged become offensive, the empyema cavity may require to be washed out once or twice daily. A funnel and a long tube should be used for this purpose, and some weak antiseptic solution employed, of a temperature of 100° Fahrenheit, 1 in 10,000 sublimate solution, or 1 in 1,000 of tincture of iodine, or a cold saturated solution of boric acid *made warm.*

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* Treves, "Operative Surgery," vol. ii. p. 741.

† Keating's "Cyclopaedia of Diseases of Children," 1889.

In some cases a counter-opening may have to be made lower down.

The drainage-tube must, in adults, be retained in the pleural cavity until the discharge has almost ceased. If after its removal there should be any signs of re-accumulation, it must be at once re-introduced.

When a portion of a rib is excised for the reasons we have already stated, it is first bared of periosteum in order to avoid the intercostal artery, and while steadied with forceps it is divided in two places about 1 inch or 1½ inch apart with a fine saw. "The section may be completed with cutting forceps, but any attempt—especially in adults—to divide the entire rib by forceps is to be deprecated. By such division the bone is unduly crushed and splintered."*

The sac of periosteum is then cut away and the intercostal artery secured. The operation is terminated as in the case of simple incision.

Senn makes some sound practical observations on this matter. He says :—

"A great deal of information is gained, as soon as the incision into the chest has been made, in reference to the expansibility of the lung. If this has not been much impaired the pus will escape with much force, especially during inspiration. Rapid evacuation is attended with some danger from over-distension of the heart and vessels in the lung, and must be guarded against by interrupting the flow from time to time by inserting the index finger into the opening. If the lung expands promptly, its lower margin can often be seen through the opening towards the end of the evacuation. The more the lung expands the less the amount of air rushing through the opening into the chest. In order to prevent syncope upon the sudden diminution of intrathoracic pressure during the evacuation of the pus, I have been in the habit of administering, before the anæsthetic is given, $\frac{1}{100}$ of a grain of atropine with $\frac{1}{8}$ of a grain of morphia hypodermically, with an alcoholic stimulant by the mouth or rectum. If, as is often the case, the pleura is lined with thick partially detached membranes, these should be removed with a dull curette, as they are invariably infected with pus microbes, and their presence in the pleural cavity would prolong infection and retard recovery."

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* Treves, "Operative Surgery," vol. ii. p. 743.

It used to be a common practice to *wash out the pleura* after pleurotomy, but far greater circumspection is now observed with regard to this practice, which has been shown to be not without danger. It is superfluous in the absence of fœtor and of saprogenic organisms, and it is useless when there exists a bronchial fistula. It should be reserved for the putrid forms of empyema, and those in which extensive false membranes are found adherent to the pleural surfaces. The following fluids have been suggested, besides those just mentioned, as quite harmless for this purpose:—Boiled water filtered with a teaspoonful of common salt to each pint; Thiersch's solution of two parts of salicylic acid, and 12 of boric to 1,000 of sterilised water; Labarraque's solution of chlorinated soda, 1 in 15 or 20 of water; a 10 to 50 per cent. solution of peroxide of hydrogen; a solution of acetate of alumina, 1 to 5 per cent. Care must be taken that the solution is always of the same temperature as the body. The irrigation should always be made with a steady siphon stream.

As we have already said, great attention must be paid to securing the most perfect antisepsis in dressing the wound, and this must be maintained throughout the whole period of healing. The average duration of treatment after operation has been estimated at four months in adults and two months in children.

Much quicker recoveries are, however, common. One of the most rapid we remember was a chronic case in a man of middle age, in which there existed a bronchial fistula, with a periodical discharge of large quantities of pus by the mouth. Pleurotomy was performed for us by Sir Joseph Lister, with re-section of a portion of a rib, and the patient was quite well within three weeks!

Another case which we saw with Dr. Sealy, of Weybridge, was operated upon for us by Professor Watson Cheyne, and the recovery was rapid. In this case also there was a communication with the lung and profuse purulent expectoration. The great value of an exploratory puncture was strikingly exemplified in this case. We had punctured with a hypodermic syringe over a somewhat circumscribed area of dulness in the back, and found pus, but on the excision of a portion of a rib just in front of the site of the puncture no pus was to be found, nor could any collection of pus be reached; but as we were certain of the existence of pus where we had punctured, another operation was made, and a fresh portion of rib was excised immediately over the mark of the exploratory puncture, and pus was of course found. This was a small localised empyema communicating with the lung, and as there was no tension on its walls from accumulation of pus, the abscess cavity could not be found except by incision directly over it. Before the operation the patient appeared to be sinking from suppurative fever, but as soon as an outlet through the chest wall was made for the pus and the cavity drained, she recovered rapidly.

In some chronic cases we find, after the pus has been evacuated and the pleural cavity drained, that the lung does not expand. It is bound down permanently by adhesions, and there is no chance of the pleural surfaces coming together, so that a fistulous opening remains in the chest, communicating with the pleural cavity, and constantly discharging pus.

To remedy this state of things operations have been proposed and carried out by Estländer, Schede, and others, which have for their object the obliterating of this cavity by the re-section of a number of ribs on the affected side. Each operation has to be specially devised for and adapted to each individual case, and its extent must depend on the situation and extent of the cavity which has to be closed. The operation is necessarily a severe one, and is usually attended with considerable shock. For methods and details we must refer to works on operative surgery.*

ADDITIONAL FORMULÆ.

Hydragogue purgative to promote absorption of pleuritic effusion.

℞ Elaterii, ½ grain.
Extr. hyoscyami, 1 grain.

M. et divide in pil. 2. The second pill to be taken if the effect of the first is insufficient. (*Matas.*)

Diuretic for the same.

℞ Caffeinæ, 40 grains.
Sodii benzoatis, 40 grains.

M. et divide in pulv. 8. One in a little water every three hours with milk diet. (*Comby.*)

The following mixture has been suggested to remove sero-fibrinous exudation, and to relieve cough.

℞ Ammonii carb., 1 dram.
Aquæ laurocerasi, ½ oz.
Syrup. lactucarii, 1 oz.
Syrup. senegæ, 1 oz.
Syrup. tolutani ad 4 oz.

M. f. mist. One tablespoonful every two hours. (*Matas.*)

For pleurisy in debilitated persons with anæmia.

℞ Ferri carb. saccharat., 12 grs.
Quininæ sulphatis, 12 grains.
Sodii bicarb., 80 grains.
Sacchari albi, 80 grains.

M. et divide in pulv. 12. A powder three or four times a day. (*Bamberger.*)

For pleurisy in children with effusion.

℞ Potassii acetatis, 20 to 60 grains.
Syrupi simp., 3 drams.
Infusi digitalis ad 3 oz.

M. f. mist. A teaspoonful every two hours.

Or,

℞ Potassii acetatis, 20 to 60 grains.
Syrupi aurantii, 3 drams.
Decoct. cinchonæ ad 3 oz.

M. f. mist. A teaspoonful every two hours.

(*Wiederhofer.*)

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* An account of these thoraco-plastic operations will be found in Treves's "Operative Surgery," p. 744.

For external application.

℞ Iodi, 1½ grain.
Potassii iodidi, 2½ drams.
Glycerini, 1½ oz.

M. f. linimentum. (*Wiederhofer*).

For pleurisy in the adult.

℞ Morphinæ hydrochlor., 1½ gr.
Quininæ sulphatis, 12 grains.
Sacchari alb., 80 grains.

M. et divide in pulv. 12. A powder every three or four hours. (*Bamberger.*)

Mixture for the same.

℞ Pulv. ipecac., 12 grains.
Pulv. digitalis, 12 grains.
Aquæ ferventis, 6 oz.
(Infuse for quarter of an hour and add)
Potassii acetatis, 4 drams.
Oxy. scillæ, 5 drams.

M. f. mist. A tablespoonful every two hours. (*Bamberger.*)

Diuretic mixture for pleurisy in the adult.

℞ Potassii acetatis, ½ oz.
Tinct. cinchonæ comp., ½ oz.
Dec. cinchonæ ad 8 oz.

M. f. mist. Two tablespoonfuls every six hours. (*Fraentzel.*)

Antipyretic and analgesic mixture.

℞ Antipyrin, 20 grains.
Phenacetin, 20 grains.
Syrupi, 2 drams.
Mucilaginis acaciæ, 2 drams.
Spr. vini gallici, ½ oz.

M. f. mist. One teaspoonful every hour until fever and pain are relieved; then every two, three, or four hours. (*Matas.*)

Powders for the same purpose.

℞ Quininæ sulph., 20 grains.
Antipyrin, 20 grains.
Phenacetin, 20 grains.
Morphinæ sulph., 1 grain.

M.; divide into eight parts (in cachets). One to be taken at half-hour intervals, until pain and fever are controlled. (*Matas.*)

Corson's paint for counter-irritation in chronic pleural exudation.

℞ Olei tiglii, 2 drams.
Ætheris, 4 drams.
Tinct. iodi comp. ad 2 oz.

M. f. pigm. To be painted over the affected part every morning.

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